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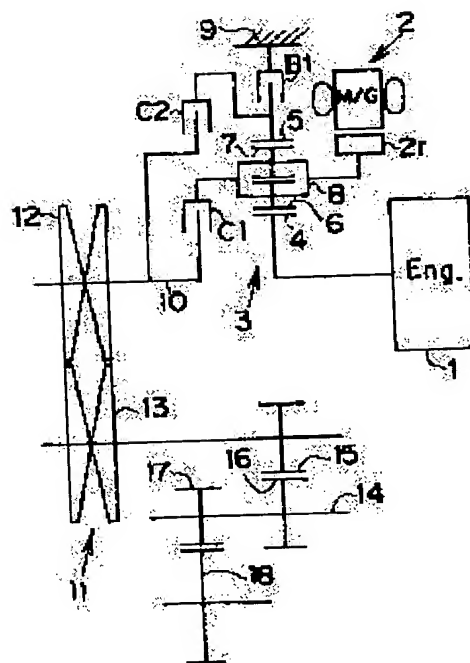
(71)Applicant : TOYOTA MOTOR CORP  
(72)Inventor : NAGASHIMA NOBUYUKI  
UMEYAMA MITSUHIRO  
ITO HIROSHI  
MORISAWA KUNIO  
SHIOIRI HIROYUKI  
IWASE YUJI

## (54) HYBRID DRIVING DEVICE

### (57)Abstract:

PROBLEM TO BE SOLVED: To provide a hybrid driving device which enables backward running with a sufficient torque even if a charge value is small.

SOLUTION: A braking means B1 which selectively fixes a rotary element 5 which is one of three rotary elements 4, 5 and 8 of a planetary gear mechanism and which makes the other two elements 4 and 8 rotate in directions opposite to each other by fixing the rotary element 5 is provided. Further, a 1st clutch means C1 which links an internal combustion engine 1 consistently or selectively with one (4) of the other two rotary elements 4 and 8, links a motor 2 consistently or selectively with the other rotary element (8) and, further, links the rotary element 8 with which the motor 2 is linked with an output member 10 selectively; and a 2nd clutch means C2 which links the output member 10 selectively with the rotary element 5 fixed by the braking means B1; are



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**CLAIMS**

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[Claim(s)]

[Claim 1] A sun gear and the ring wheel arranged on a concentric circle to this sun gear, The epicyclic gear device which uses as a rotation element the carrier which held two or more pinion gears arranged between these sun gears and a ring wheel free [ rotation and revolution ] is minded. In the hybrid driving gear which outputs power to an output member from an internal combustion engine and a motor While a brake means to fix alternatively the rotation element used as the relation which is any rotation 1 of said three rotation elements, and other two rotation elements rotate to an opposite direction mutually by being fixed is established Said internal combustion engine is connected with one rotation element of two rotation elements besides the above always or alternatively. And a 1st clutch means to connect alternatively with said output member the rotation element with which said motor was connected with the rotation element of another side always or alternatively, and said motor was connected further, The hybrid driving gear characterized by establishing a 2nd clutch means to connect said output member with the rotation element fixed by said brake means alternatively.

[Claim 2] Said epicyclic gear device consists of a double pinion mold epicyclic gear device in which it has the 2nd pinion gear which geared to the 1st pinion gear which geared to said sun gear, this 1st pinion gear, and said ring wheel. Said motor is connected with the carrier holding these pinion gears. And an internal combustion engine is connected with said sun gear, and said brake means is further arranged between said ring wheels and casing. The hybrid driving gear according to claim 1 characterized by being constituted so that it may be connected with said ring wheel through the 2nd clutch means, while said output member is connected with said carrier through the 1st clutch means.

[Claim 3] Said epicyclic gear device consists of a double pinion mold epicyclic gear device in which it has the 2nd pinion gear which geared to the 1st pinion gear which geared to said sun gear, this 1st pinion gear, and said ring wheel. Said internal combustion engine is connected with the carrier holding these pinion gears. And a motor is connected with said sun gear and said brake means is further arranged between said ring wheels and casing. The hybrid driving gear according to claim 1 characterized by being constituted so that it may be connected with said ring wheel through the 2nd clutch means, while said output member is connected with said sun gear through the 1st clutch means.

[Claim 4] Said epicyclic gear device consists of a single pinion mold epicyclic gear device in which it has two or more pinion gears which geared to said sun gear and ring wheel. Said brake means is arranged between the carriers and casing holding these pinion gears. And a motor is connected with said sun gear and said internal combustion engine is further connected with said ring wheel. The hybrid driving gear according to claim 1 characterized by being constituted so that it may be connected with said carrier through the 2nd clutch means, while said output member is connected with said sun gear through the 1st clutch means.

[Claim 5] A sun gear and the ring wheel arranged on a concentric circle to this sun gear, The epicyclic gear device which uses as a rotation element the carrier which held two or more pinion gears arranged between these sun gears and a ring wheel free [ rotation and revolution ] is minded. In the hybrid driving gear which outputs power to an output member from an internal combustion engine and a motor While

said motor is connected with the rotation element used as the relation which is any rotation 1 of said three rotation elements, and other two rotation elements rotate to an opposite direction mutually by being fixed through the 1st input clutch means Said motor is connected with one rotation element of two rotation elements besides the above through the 2nd input clutch means. And a 1st output clutch means to connect alternatively with said output member the rotation element with which said internal combustion engine was connected with the rotation element of another side always or alternatively, and said motor was further connected by said 2nd input clutch means, The hybrid driving gear characterized by establishing a 2nd output clutch means to connect alternatively with said output member the rotation element connected with said motor by said 1st input clutch means.

[Claim 6] The hybrid driving gear of claim 5 characterized by arranging the one way clutch between said rotation elements and casing which are connected with said 1st input clutch means and said 2nd output clutch means.

[Claim 7] In the hybrid driving gear which compounds individually the power which an internal combustion engine outputs, and the power which a motor outputs, and transmits it to an output member The 1st sun gear and the ring wheel arranged on a concentric circle to this 1st sun gear, The carrier which holds the 2nd pinion gear which geared to the 1st pinion gear and this 1st pinion gear which geared to the 1st sun gear, and said ring wheel free [ rotation and revolution ], The RABINIYO mold epicyclic gear device in which it has the 2nd sun gear which got into gear to the 2nd pinion gear, A 1st clutch means to connect said internal combustion engine with said 1st sun gear alternatively, While having a 2nd clutch means to connect said internal combustion engine with said 2nd sun gear alternatively, and a brake means to fix said carrier alternatively and connecting said motor with said 2nd sun gear The hybrid driving gear characterized by connecting said output member with said ring wheel.

[Claim 8] In the hybrid driving gear which compounds individually the power which an internal combustion engine outputs, and the power which a motor outputs, and transmits it to an output member The 1st sun gear and the ring wheel arranged on a concentric circle to this 1st sun gear, The carrier which holds the 2nd pinion gear which geared to the 1st pinion gear and this 1st pinion gear which geared to the 1st sun gear, and said ring wheel free [ rotation and revolution ], The RABINIYO mold epicyclic gear device in which it has the 2nd sun gear which got into gear to the 2nd pinion gear, A 1st clutch means to connect said internal combustion engine with said 1st sun gear alternatively, While having a 2nd clutch means to connect said motor with said carrier alternatively, and a brake means to fix said ring wheel alternatively and connecting said motor with said 2nd sun gear The hybrid driving gear characterized by connecting said output member with said carrier.

[Claim 9] Claim 7 characterized by establishing further the fixed means which stops alternatively rotation of the member connected with said output member or the output member at one, or a hybrid driving gear given in 8.

[Claim 10] Claim 7 characterized by the number of teeth of the part which has geared to the number of teeth and said 2nd sun gear of the part which has geared to said 1st pinion gear of said 2nd pinion gear being different, or a hybrid driving gear given in 8.

[Claim 11] In the hybrid driving gear which compounds individually the power which an internal combustion engine outputs, and the power which a motor outputs, and transmits it to an output member A sun gear and the ring wheel arranged on a concentric circle to this sun gear, The 1st epicyclic gear device and the 2nd epicyclic gear device which carry out the rotation element of the carrier which held the pinion gear arranged between these sun gears and a ring wheel free [ rotation and revolution ], While a brake means to fix alternatively the rotation element used as the relation which is any one rotation element in the 2nd epicyclic gear device, and other two rotation elements rotate to an opposite direction mutually by being fixed is established A 2nd clutch means to connect said internal combustion engine with the rotation element of either of the two rotation elements besides the above alternatively is established. And the rotation element used as the relation which other two rotation elements rotate to the method of opposite mutually by connecting the rotation element of another side with said output member, being any one rotation element in said 1st epicyclic gear device, and being fixed Connect with said output member and said internal combustion engine is connected with the rotation element of either

of the two rotation elements besides the above in the 1st epicyclic gear device of a parenthesis through the 1st clutch means. The hybrid driving gear characterized by being constituted so that the power of said motor may furthermore be transmitted to the rotation element of another side of the two rotation elements besides the above in said 1st epicyclic gear device.

[Claim 12] Said 1st epicyclic gear device and the 2nd epicyclic gear device are constituted by the single pinion mold epicyclic gear device in which two or more pinion gears which geared to the sun gear and the ring wheel were held free [ rotation and revolution ] with said carrier. While being arranged between the carrier of the 2nd epicyclic gear device, and casing, said brake means This carrier and the ring wheel of said 1st epicyclic gear device are connected. Said 2nd clutch means Are arranged so that the sun gear and internal combustion engine of said 2nd epicyclic gear device may be connected, and said motor is connected with the sun gear for \*\*. And the ring wheel of the 2nd epicyclic gear device is connected with the carrier of the 1st epicyclic gear device. The hybrid driving gear of claim 11 characterized by connecting the carrier of the 1st epicyclic gear device with the ring wheel and output member of the 2nd epicyclic gear device furthermore, and connecting the sun gear of the 1st epicyclic gear device of a parenthesis with said internal combustion engine through said 1st clutch means.

[Claim 13] Said 1st epicyclic gear device and the 2nd epicyclic gear device are constituted by the single pinion mold epicyclic gear device in which two or more pinion gears which geared to the sun gear and the ring wheel were held free [ rotation and revolution ] with said carrier. Said brake means is arranged so that these carriers and a sun gear may be fixed alternatively, while the carrier of the 2nd epicyclic gear device is connected with the sun gear of said 1st epicyclic gear device. Said 2nd clutch means is arranged so that the sun gear and internal combustion engine of said 2nd epicyclic gear device may be connected. And this carrier is connected with said output member while the ring wheel of the 2nd epicyclic gear device is connected with the carrier of the 1st epicyclic gear device. And the hybrid driving gear of claim 11 characterized by connecting the ring wheel of this 1st epicyclic gear device with said internal combustion engine through said 1st clutch means.

[Claim 14] The hybrid driving gear according to claim 11 to 13 characterized by establishing further the fixed means which stops alternatively rotation of the member currently united with said output member or the output member.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the hybrid driving gear equipped with the motor which operates with power, such as internal combustion engines, such as a gasoline engine and a diesel power plant, a motor, and a motor generator, and outputs power for cars.

[0002]

[Description of the Prior Art] An internal combustion engine produces exhaust gas unescapable as everyone knows. The cleanliness of exhaust gas tends to fall at the time of heavy load operation to which the component and amount of the exhaust gas increased throttle opening as a general inclination depending on an internal combustion engine's operational status, and fuel consumption also tends to fall. On the other hand, recently, the hybrid driving gear is developed so that the demand of the cleanliness to the exhaust gas of the car carrying an internal combustion engine may become high and may meet such a request.

[0003] A hybrid driving gear is a driving gear equipped with the internal combustion engine and the motor as a source of power, and fundamentally, it operates in the most efficient condition, and the internal combustion engine consists of other run states so that a motor may be used as a source of power auxiliary. Therefore, although the change gear [ as / in the conventional car which made only the internal combustion engine the source of power ] was not used since the hybrid driving gear was equipped with the motor which can control torque by the current, with the hybrid driving gear which uses an internal combustion engine also as a source of power for transit only as a source of power for a generation of electrical energy, a change gear is increasingly carried like the so-called parallel hybrid format. Furthermore, an internal combustion engine's torque and the torque of a motor are inputted into single change gear styles, such as an epicyclic gear device, and the equipment constituted so that an internal combustion engine's output torque might be amplified and outputted is also developed.

[0004] The example is indicated by JP,9-37411,A. While the equipment indicated by drawing 11 of this official report is equipped with a double pinion mold epicyclic gear device and an output shaft is connected with that ring wheel, the input clutch which a motor generator is connected with a sun gear, and connects a carrier and an engine alternatively is prepared, and the unification clutch which connects the brake which fixes a carrier alternatively further, and a carrier and a sun gear, and unifies the whole epicyclic gear device is prepared. And the output shaft can be connected with a nonstep variable speed gear.

[0005] Therefore, in the hybrid driving gear indicated by drawing 11 of the above-mentioned official report, if power is inputted into a sun gear from a motor generator in the condition of having inputted power into the carrier from the engine, larger torque than an engine torque will be outputted to the ring wheel which is an output member, and inverse rotation of the motor generator will be carried out and power will be absorbed, it can generate electricity. Moreover, driving force can be continuously changed according to the change gear ratio in a nonstep variable speed gear. Using the torque-amplification function and the modification function of the continuous change gear ratio of a nonstep variable speed

gear in such an epicyclic gear device, an internal combustion engine can be operated so that fuel consumption may become the best.

[0006]

[Problem(s) to be Solved by the Invention] If it has the motor as a source of power as mentioned above, since the output torque of a motor is controllable by the current, a change gear is fundamentally unnecessary and said epicyclic gear device and nonstep variable speed gear are used also in the conventional hybrid driving gear mentioned above as a control means for operating so that an internal combustion engine's fuel consumption may become best. Therefore, when running with an internal combustion engine's output, an opposite direction cannot be made to rotate the ring wheel which is an output element with the configuration of the above-mentioned epicyclic gear device to the carrier which is an input element. Therefore, in carrying out go-astern transit with the above-mentioned conventional hybrid equipment, while making an internal combustion engine into an idling condition, the opposite direction is made to rotate the ring wheel which is an output element with an internal combustion engine by fixing a carrier in a brake and operating a motor generator as a motor in the condition.

[0007] That is, it consists of above-mentioned conventional hybrid driving gears so that a motor may perform go-astern transit. Therefore, when there were few charges (SOC) of a capacitor (dc-battery), sufficient torque required of go-astern transit may be unable to be outputted. It must stop having to wait for go-astern transit for that purpose, although what is necessary is to charge by starting an internal combustion engine and just to increase the charge of a dc-battery, in order to cancel such un-arranging until charge is completed. With the parallel hybrid equipment of a format with which especially the motor served as the generator, since the transit and the generation of electrical energy by the motor could not be performed to coincidence, when the charge in a capacitor fell, there was un-arranging [ to which go-astern transit becomes difficult immediately ].

[0008] This invention makes the above-mentioned situation a background, is made, and even if it is a case with few charges of a capacitor, it aims at offering the hybrid driving gear which can secure the torque for go-astern transit in need 10 minutes.

[0009]

[Means for Solving the Problem and its Function] In order to solve the above-mentioned technical problem, invention indicated to claim 1 A sun gear and the ring wheel arranged on a concentric circle to this sun gear, The epicyclic gear device which uses as a rotation element the carrier which held two or more pinion gears arranged between these sun gears and a ring wheel free [ rotation and revolution ] is minded. In the hybrid driving gear which outputs power to an output member from an internal combustion engine and a motor While a brake means to fix alternatively the rotation element used as the relation which is any rotation 1 of said three rotation elements, and other two rotation elements rotate to an opposite direction mutually by being fixed is established Said internal combustion engine is connected with one rotation element of two rotation elements besides the above always or alternatively. And a 1st clutch means to connect alternatively with said output member the rotation element with which said motor was connected with the rotation element of another side always or alternatively, and said motor was connected further, It is characterized by establishing a 2nd clutch means to connect said output member with the rotation element fixed by said brake alternatively.

[0010] Therefore, while fixing the rotation element connected with this brake means by the brake means according to invention of claim 1 If connection to the rotation element and output member which connect with an output member the rotation element with which the motor was connected, and are further fixed with a brake means by making the 2nd clutch means into non-operating state by the 1st clutch means is canceled The rotation element with which the rotation element with which the internal combustion engine was connected, and the output member are connected serves as relation mutually rotated to an opposite direction. Therefore, if an internal combustion engine is driven, an output member can carry out inverse rotation and can carry out go-astern transit. Moreover, cancel immobilization of a rotation element by making a brake means into non-operating state, and connection to the rotation element with which the motor was connected with the output member by making the 1st clutch means into non-operating state is canceled. If the rotation element which the 2nd clutch means is furthermore

operated and is connected with the brake means, and an output member are connected, since the power of a motor can be inputted into the rotation element which turns into a reaction force element to the rotation element with which the internal combustion engine is connected. It can be made to stop by being able to control the torque of an output member by torque of a motor, and controlling the output of a motor for rotation of an output member, with an internal combustion engine operated.

[0011] Invention of claim 2 is set in the configuration of claim 1. Moreover, said epicyclic gear device It consists of a double pinion mold epicyclic gear device in which it has the 2nd pinion gear which geared to the 1st pinion gear which geared to said sun gear, this 1st pinion gear, and said ring wheel. Said motor is connected with the carrier holding these pinion gears. And an internal combustion engine is connected with said sun gear, and said brake means is further arranged between said ring wheels and casing. While said output member is connected with said carrier through the 1st clutch means, it is characterized by being constituted so that it may connect with said ring wheel through the 2nd clutch means.

[0012] therefore, if a ring wheel is fixed with a brake means according to invention of claim 2, a sun gear and a carrier will rotate to an opposite direction mutually -- relation -- by \*\*, if an internal combustion engine is driven where a carrier is connected with an output member with the 1st clutch means, an internal combustion engine can do inverse rotation to an opposite direction, therefore an output member can perform go-astern transit. Moreover, since the power of a motor will be inputted into the carrier which serves as a reaction force element to a sun gear if a ring wheel and an output member are connected with the 2nd clutch means while canceling immobilization of the ring wheel by the brake means, it can be made to stop by being able to control the torque of an output member by torque of a motor, and controlling the output of a motor for rotation of an output member, with an internal combustion engine operated.

[0013] Invention of claim 3 is set in the configuration of claim 1. Said epicyclic gear device It consists of a double pinion mold epicyclic gear device in which it has the 2nd pinion gear which geared to the 1st pinion gear which geared to said sun gear, this 1st pinion gear, and said ring wheel. Said internal combustion engine is connected with the carrier holding these pinion gears. And a motor is connected with said sun gear and said brake means is further arranged between said ring wheels and casing. While said output member is connected with said sun gear through the 1st clutch means, it is characterized by being constituted so that it may connect with said ring wheel through the 2nd clutch means.

[0014] Therefore, while fixing a ring wheel with a brake means according to invention of claim 3 If it considers as the condition of having connected the sun gear and the output member with the 1st clutch means, and having canceled connection to the ring wheel and output member by the 2nd clutch means Since a sun gear and a carrier serve as relation mutually rotated to an opposite direction like invention of claim 2 If an internal combustion engine's power is inputted into a carrier, in order that a sun gear may carry out inverse rotation to a carrier to an opposite direction, i.e., an internal combustion engine, consequently the output member of one may carry out inverse rotation to a sun gear, an internal combustion engine's power can perform go-astern transit. Moreover, if connection to the sun gear and output member by the 1st clutch means is canceled where immobilization of the ring wheel by the brake means is canceled, and a ring wheel and an output member are connected with the 2nd clutch means Since the power of a motor is inputted into the sun gear which serves as a reaction force element to a carrier, it can be made to stop by being able to control the torque of an output member by torque of a motor, and controlling the output of a motor for rotation of an output member, with an internal combustion engine operated.

[0015] Invention of claim 4 is set in the configuration of claim 1. Said epicyclic gear device It consists of a single pinion mold epicyclic gear device in which it has two or more pinion gears which geared to said sun gear and ring wheel. Said brake means is arranged between the carriers and casing holding these pinion gears. And a motor is connected with said sun gear and said internal combustion engine is further connected with said ring wheel. While said output member is connected with said sun gear through the 1st clutch means, it is characterized by being constituted so that it may connect with said carrier through the 2nd clutch means.

[0016] Therefore, while fixing a carrier with a brake means according to invention of claim 4 If it



considers as the condition of having connected the sun gear and the output member with the 1st clutch means, and having canceled connection to the carrier and output member by the 2nd clutch means. If it becomes the relation which the sun gear connected with the ring wheel with which the internal combustion engine is connected when a carrier is a fixed element, and the output member rotates to an opposite direction mutually, therefore an internal combustion engine is driven. The output member connected with a sun gear and this will carry out inverse rotation (namely, an internal combustion engine's hand of cut rotation of an opposite direction), consequently go-astern transit can be carried out with an internal combustion engine's power. Moreover, if an output member and a carrier are connected with the 2nd clutch means while canceling connection to the output member and sun gear by the 1st clutch means, where immobilization of the carrier by the brake means is canceled. Since the power from a motor can be inputted into the sun gear which serves as a reaction force element to the ring wheel with which the internal combustion engine is connected. It can be made to stop by being able to control by torque of a motor the torque of the output member connected with the carrier, and controlling the output of a motor for rotation of an output member, with an internal combustion engine operated.

[0017] The ring wheel by which invention of claim 5 has been arranged on a concentric circle to a sun gear and this sun gear, The epicyclic gear device which uses as a rotation element the carrier which held two or more pinion gears arranged between these sun gears and a ring wheel free [ rotation and revolution ] is minded. In the hybrid driving gear which outputs power to an output member from an internal combustion engine and a motor. While said motor is connected with the rotation element used as the relation which is any rotation 1 of said three rotation elements, and other two rotation elements rotate to an opposite direction mutually by being fixed through the 1st input clutch means. Said motor is connected with one rotation element of two rotation elements besides the above through the 2nd input clutch means. And a 1st output clutch means to connect alternatively with said output member the rotation element with which said internal combustion engine was connected with the rotation element of another side always or alternatively, and said motor was further connected by said 2nd input clutch means, It is characterized by establishing a 2nd output clutch means to connect alternatively with said output member the rotation element connected with said motor by said 1st input clutch means.

[0018] Therefore, according to invention of claim 5, clutch means \*\*\*\* aforementioned each of these rotation members are connected by making the 1st input clutch means and the 1st output clutch means into operating state. And if the connection condition by these clutch means is canceled by making the 2nd input clutch means and the 2nd output clutch means into non-operating state. It is transmitted to the rotation element with which the power which a motor outputs was connected by the 1st input clutch means, and an output member is connected with other rotation elements to this. In this condition, if the rotation element which the rotation element with which the rotation element with which the internal combustion engine is connected, and the output member are connected turns into the so-called reaction force element mutually, therefore is connected by the 1st input clutch means with the motor is fixed, an internal combustion engine's power is reversed, and it is transmitted to an output member, consequently go-astern transit can be carried out with an internal combustion engine's power. In that case, if the power which a motor outputs is controlled, the rotational frequency or torque of a rotation element with which the output member is connected can change, therefore the driving force at the time of go-astern transit can be controlled by the motor. Moreover, rotation of the output member can also be stopped by controlling the output of a motor. On the other hand, operate the 2nd input clutch means and the 2nd output clutch means, and each rotation member by these clutch means is connected. And if the connection actuation by these clutch means is canceled by making the 2nd input clutch means and the 1st output clutch means into non-operating state, while the rotation element with which the output member is connected by the 2nd output clutch means will turn into an output element. The rotation element by which the motor is connected with the rotation element with which the internal combustion engine is connected with the 2nd input clutch means turns into a reaction force element mutually. Therefore, if the power which a motor outputs where an internal combustion engine is operated is changed, since the torque of an output member will change according to the torque which a motor outputs, it can be made to stop by being able to control the torque of an output member by torque of a



motor, and controlling the output of a motor for rotation of an output member, with an internal combustion engine operated.

[0019] Invention of claim 6 is characterized by arranging the one way clutch between said rotation elements and casing which are connected with said 1st input clutch means and said 2nd output clutch means in the configuration of claim 5.

[0020] therefore, according to invention of claim 6, where rotation of said rotation element is stopped with an one way clutch Since the rotation element with which the motor is connected with the rotation element with which the internal combustion engine is connected turns into a reaction force element mutually While the rotation element connected with this motor by the 2nd input clutch means by carrying out inverse rotation of the motor carries out inverse rotation, in order that the rotation element with which the internal combustion engine is connected may carry out forward rotation, the output torque of a motor is reversed and it is transmitted to an internal combustion engine. That is, since an internal combustion engine can be rotated with a motor, an internal combustion engine can be put into operation by the thing of supplying a fuel to an internal combustion engine in this condition.

[0021] In the hybrid driving gear which invention of claim 7 compounds individually the power which an internal combustion engine outputs, and the power which a motor outputs, and is transmitted to an output member The 1st sun gear and the ring wheel arranged on a concentric circle to this 1st sun gear, The carrier which holds the 2nd pinion gear which geared to the 1st pinion gear and this 1st pinion gear which geared to the 1st sun gear, and said ring wheel free [ rotation and revolution ], The RABINIYO mold epicyclic gear device in which it has the 2nd sun gear which got into gear to the 2nd pinion gear, A 1st clutch means to connect said internal combustion engine with said 1st sun gear alternatively, While having a 2nd clutch means to connect said internal combustion engine with said 2nd sun gear alternatively, and a brake means to fix said carrier alternatively and connecting said motor with said 2nd sun gear It is characterized by connecting said output member with said ring wheel.

[0022] Therefore, if according to invention of claim 7 a carrier is fixed with a brake means, and connection by the 1st clutch means is canceled and an internal combustion engine is further connected with the 2nd sun gear with the 2nd clutch means Since the 2nd sun gear and ring wheel become the relation of the sun gear and ring wheel in a single pinion mold epicyclic gear device, the output member connected with a ring wheel and this carries out inverse rotation by carrying out forward rotation of the 2nd sun gear with an internal combustion engine. That is, an internal combustion engine's power can perform go-astern transit. Moreover, if connection of each rotation member is canceled by making the 2nd clutch means and a brake means into non-operating state while connecting an internal combustion engine with the 1st sun gear with the 1st clutch means, it will be in the condition that the internal combustion engine and the motor were connected with the 1st sun gear and the 2nd sun gear which serve as a reaction force element mutually. Therefore, it can be made to stop by being able to control the torque of an output member by torque of a motor, and controlling the output of a motor for rotation of an output member, with an internal combustion engine operated.

[0023] In the hybrid driving gear which invention of claim 8 compounds individually the power which an internal combustion engine outputs, and the power which a motor outputs, and is transmitted to an output member The 1st sun gear and the ring wheel arranged on a concentric circle to this 1st sun gear, The carrier which holds the 2nd pinion gear which geared to the 1st pinion gear and this 1st pinion gear which geared to the 1st sun gear, and said ring wheel free [ rotation and revolution ], The RABINIYO mold epicyclic gear device in which it has the 2nd sun gear which got into gear to the 2nd pinion gear, A 1st clutch means to connect said internal combustion engine with said 1st sun gear alternatively, While having a 2nd clutch means to connect said motor with said carrier alternatively, and a brake means to fix said ring wheel alternatively and connecting said motor with said 2nd sun gear, it is characterized by connecting said output member with said carrier.

[0024] Therefore, according to invention of claim 8, a carrier carries out inverse rotation to the 1st sun gear by connecting an internal combustion engine with the 1st sun gear with the 1st clutch means, and fixing a ring wheel and canceling connection to a carrier and a motor by making the 2nd clutch means into non-operating state further with a brake means. Therefore, by driving an internal combustion engine

and carrying out forward rotation of the 1st sun gear, the output member connected with a carrier and this can carry out inverse rotation, consequently go-astern transit can be carried out with an internal combustion engine's power. Moreover, if only the 1st clutch means is operated and an internal combustion engine is connected with the 1st sun gear, since it will be in the condition that the internal combustion engine and the motor were connected with each sun gear which serves as a reaction force element mutually, it can be made to stop by being able to control the torque of an output member by torque of a motor, and controlling the output of a motor for rotation of an output member, with an internal combustion engine operated.

[0025] Invention of claim 9 is characterized by establishing further the fixed means which stops alternatively rotation of the member connected with said output member or the output member at one in claim 7 or the configuration of 8.

[0026] Therefore, according to invention of claim 9, the 1st sun gear which serves as a reaction force element to the 2nd sun gear with which the motor was connected when operating the motor in the state of [ the ] the stop rotates rotation of the member of one to the 2nd sun gear in an opposite direction to an output member or this with a fixed means. Therefore, the internal combustion engine is connected with the 1st sun gear with the 1st clutch means, and if inverse rotation of the motor is carried out, the internal combustion engine connected with the 1st sun gear and this will do forward rotation. If a fuel is supplied to an internal combustion engine and it lights in the condition if needed, an internal combustion engine can be put into operation.

[0027] Invention of claim 10 is characterized by the number of teeth of the part which has geared to the number of teeth and said 2nd sun gear of the part which has geared to said 1st pinion gear of said 2nd pinion gear being different in claim 7 or the configuration of 8.

[0028] Therefore, according to invention of claim 10, driving force in the case of running under the power of a motor can be enlarged by making [ many ] the number of teeth of the part with which it was different from the configuration the gear ratio at the time of transmitting to an output member indicated the power of a motor to be to claim 7 or 8, for example, the 2nd sun gear has geared.

[0029] In the hybrid driving gear which invention of claim 11 compounds individually the power which an internal combustion engine outputs, and the power which a motor outputs, and is transmitted to an output member A sun gear and the ring wheel arranged on a concentric circle to this sun gear, The 1st epicyclic gear device and the 2nd epicyclic gear device which carry out the rotation element of the carrier which held the pinion gear arranged between these sun gears and a ring wheel free [ rotation and revolution ], While a brake means to fix alternatively the rotation element used as the relation which is any one rotation element in the 2nd epicyclic gear device, and other two rotation elements rotate to an opposite direction mutually by being fixed is established A 2nd clutch means to connect said internal combustion engine with the rotation element of either of the two rotation elements besides the above alternatively is established. And the rotation element used as the relation which other two rotation elements rotate to the method of opposite mutually by connecting the rotation element of another side with said output member, being any one rotation element in said 1st epicyclic gear device, and being fixed Connect with said output member and said internal combustion engine is connected with the rotation element of either of the two rotation elements besides the above in the 1st epicyclic gear device of a parenthesis through the 1st clutch means. It is characterized by being constituted so that the power of said motor may furthermore be transmitted to the rotation element of another side of the two rotation elements besides the above in said 1st epicyclic gear device.

[0030] Therefore, according to invention of claim 11, other two rotation elements will be in the condition of rotating to an opposite direction mutually, by fixing the predetermined rotation element in the 2nd epicyclic gear device with a brake means. And since an internal combustion engine is connected with one side of the two rotation elements besides these and the output member is connected with another side by operating the 2nd clutch means, an output member rotates to an opposite direction with an internal combustion engine by driving an internal combustion engine. Therefore, go-astern transit can be carried out with an internal combustion engine's power. Moreover, where it connected the internal combustion engine with the predetermined rotation element of the 1st epicyclic gear device with the 1st

clutch means and connection of each rotation element is canceled by making the 2nd clutch means and a brake means into non-operating state. When a motor is reached and an internal combustion engine is driven, by the 2nd epicyclic gear device. Since torque is inputted into other rotation elements from an internal combustion engine in the condition that the load from an output member is applied to the predetermined rotation element, torque arises to the rotation element of further others, and this is transmitted to either of two rotation elements besides the above in the 1st epicyclic gear device. Moreover, by the 1st epicyclic gear device, since the torque which an internal combustion engine outputs to the rotation element of another side starts and the torque according to the output of a motor is acting on the rotation element of said another side, an internal combustion engine's power and the power of a motor will act on two rotation elements which turn into a reaction force element mutually on both sides of the rotation element which is an output element. Consequently, it can be made to stop by being able to control the torque of an output member by torque of a motor, and controlling the output of a motor for rotation of an output member, with an internal combustion engine operated.

[0031] Invention of claim 12 is set in the configuration of claim 11. Said 1st epicyclic gear device and the 2nd epicyclic gear device. It is constituted by the single pinion mold epicyclic gear device in which two or more pinion gears which geared to the sun gear and the ring wheel were held free [ rotation and revolution ] with said carrier. While being arranged between the carrier of the 2nd epicyclic gear device, and casing, said brake means. This carrier and the ring wheel of said 1st epicyclic gear device are connected. Said 2nd clutch means. Are arranged so that the sun gear and internal combustion engine of said 2nd epicyclic gear device may be connected, and said motor is connected with the sun gear for \*\*. And the ring wheel of the 2nd epicyclic gear device is connected with the carrier of the 1st epicyclic gear device. It is characterized by connecting the carrier of the 1st epicyclic gear device with the ring wheel and output member of the 2nd epicyclic gear device furthermore, and connecting the sun gear of the 1st epicyclic gear device of a parenthesis with said internal combustion engine through said 1st clutch means.

[0032] Therefore, according to invention of claim 12, a sun gear and a ring wheel serve as relation mutually rotated to an opposite direction by fixing the carrier in the 2nd epicyclic gear device with a brake means. And since an internal combustion engine is connected with the sun gear of the 2nd epicyclic gear device and the output member is connected with the ring wheel by operating the 2nd clutch means, an output member rotates to an opposite direction with an internal combustion engine by driving an internal combustion engine. Therefore, go-astern transit can be carried out with an internal combustion engine's power. Moreover, where it connected the internal combustion engine with the sun gear of the 1st epicyclic gear device with the 1st clutch means and connection of each rotation member is canceled by making the 2nd clutch means and a brake means into non-operating state. If a motor and an internal combustion engine are driven, since torque will be inputted into a sun gear in the condition that the load from an output member is applied to the ring wheel, in the 2nd epicyclic gear device, torque arises in a carrier and this is transmitted to the ring wheel of the 1st epicyclic gear device. Moreover, by the 1st epicyclic gear device, since the torque which an internal combustion engine outputs to a sun gear starts and the torque according to the output of a motor is acting on a ring wheel, an internal combustion engine's power and the power of a motor will act on the sun gear and ring wheel which serve as a reaction force element mutually on both sides of the carrier which is an output element. Consequently, it can be made to stop by being able to control the torque of an output member by torque of a motor, and controlling the output of a motor for rotation of an output member, with an internal combustion engine operated.

[0033] Invention of claim 13 is set in the configuration of claim 11. Said 1st epicyclic gear device and the 2nd epicyclic gear device. It is constituted by the single pinion mold epicyclic gear device in which two or more pinion gears which geared to the sun gear and the ring wheel were held free [ rotation and revolution ] with said carrier. Said brake means is arranged so that these carriers and a sun gear may be fixed alternatively, while the carrier of the 2nd epicyclic gear device is connected with the sun gear of said 1st epicyclic gear device. Said 2nd clutch means is arranged so that the sun gear and internal combustion engine of said 2nd epicyclic gear device may be connected. And it is characterized by

connecting this carrier with said output member, while the ring wheel of the 2nd epicyclic gear device is connected with the carrier of the 1st epicyclic gear device, and connecting the ring wheel of the 1st epicyclic gear device of a parenthesis with said internal combustion engine through said 1st clutch means.

[0034] Therefore, according to invention of claim 13, a sun gear and a ring wheel will be in the condition of rotating to an opposite direction mutually, by fixing the carrier in the 2nd epicyclic gear device with a brake means. And since an internal combustion engine is connected with the sun gear of the 2nd epicyclic gear device and the output member is connected with the ring wheel by operating the 2nd clutch means, an output member rotates to an opposite direction with an internal combustion engine by driving an internal combustion engine. Therefore, go-astern transit can be carried out with an internal combustion engine's power. Moreover, where it connected the internal combustion engine with the ring wheel of the 1st epicyclic gear device with the 1st clutch means and connection of each rotation member is canceled by making the 2nd clutch means and a brake means into non-operating state. If a motor is reached and an internal combustion engine is driven, since torque will be inputted into a sun gear in the condition that the load from an output member is applied to the ring wheel, in the 2nd epicyclic gear device, torque arises in a carrier and this is transmitted to the sun gear of the 1st epicyclic gear device. Moreover, by the 1st epicyclic gear device, since the torque which an internal combustion engine outputs to a ring wheel starts and the torque according to the output of a motor is acting on a sun gear, an internal combustion engine's power and the power of a motor will act on the ring wheel and sun gear which serve as a reaction force element mutually on both sides of the carrier which is an output element. Consequently, it can be made to stop by being able to control the torque of an output member by torque of a motor, and controlling the output of a motor for rotation of an output member, with an internal combustion engine operated.

[0035] And invention of claim 14 is characterized by establishing further the fixed means which stops alternatively rotation of the member currently united with said output member or the output member in the configuration of claim 11 or either of 13.

[0036] Therefore, since the rotation element which connected the internal combustion engine with the rotation element which connected the motor by stopping rotation of an output member or the rotation element of this and one with a fixed means will be in the condition rotate to this direction or an opposite direction according to invention of claim 14, if the torque of a proper direction is inputted into the rotation element connected with this from the motor, an internal combustion engine will be rotated by the forward hand of cut. Therefore, an internal combustion engine can be put into operation by supplying a fuel to an internal combustion engine in the condition, and lighting if needed.

[0037]

[Embodiment of the Invention] Below, this invention is explained more concretely. Drawing 1 is the mimetic diagram showing an example of the hybrid driving gear concerning this invention, and it is constituted so that it may compound and an internal combustion engine 1 and the power of a motor 2 may be outputted individually. The internal combustion engine 1 is a power plant which burns fuels, such as a gasoline engine and a diesel power plant, and outputs power. The following explanation describes an internal combustion engine an engine (Eng.) 1.

[0038] Moreover, a motor 2 is a power plant which rotates by supplying a current in short and outputs power, the motor of various kinds of formats, such as a synchronous type, can be used for it, and the motor further equipped with the generation-of-electrical-energy function can be used for it. The following explanation shows as an example what was equipped with the generation-of-electrical-energy function as a motor, and describes a motor a motor generator (M/G) 2.

[0039] The device which made the subject the double pinion mold epicyclic gear device 3 as a device which compounds and outputs individually the power of these engines 1 and a motor generator 2 is established. This epicyclic gear device 3 is the thing of a well-known configuration of using as a rotation element the carrier 8 which held the 2nd pinion gear 7 which geared to the 1st pinion gear 6 which gears to a sun gear 4, and this 1st pinion gear 6 and ring wheel 5 free [ rotation and revolution ], and performing a differential operation among these three rotation elements. [ the sun gear 4 which is an

external-tooth gearing, this sun gear 4 and the ring wheel 5 which is the internal gear arranged on a concentric circle, and ]

[0040] The output shaft (for example, crankshaft) of an engine 1 is connected with the sun gear 4 among these rotation elements. Since it arises when a reciprocating engine is used as an engine 1, the fluctuation, i.e., the vibration, of torque by intermittent combustion of a fuel, in order to absorb or ease the vibration, a damper style (not shown) may be made to intervene between an engine 1 and a sun gear 4. Moreover, Rotor 2r of a motor generator 2 is connected with the carrier 8.

[0041] Furthermore, it is a brake B1 between a ring wheel 5 and casing 9. It is prepared. This brake B1 is for fixing a ring wheel 5 alternatively, and is casing 9. The equipment of friction engagement types, such as a multiple disc brake prepared in between and a band brake, can be used. Moreover, this brake B1 The thing of a format which operates electrically in addition to the thing of a format which operates with oil pressure can also be used.

[0042] The output shaft 10 which is an output member is arranged on the same axis as an engine 1. Two clutches are prepared as a means for transmitting power alternatively to this output shaft 10. Namely, the 1st clutch C1 which connects a carrier 8 and an output shaft 10 alternatively The 2nd clutch C2 which connects a ring wheel 5 and an output shaft 10 alternatively It is prepared. These clutches C1 and C2 Although the thing of the multi-plate type engaged and released with oil pressure is the most common, what could gear in addition to this, and could use the thing of various kinds of formats, such as a clutch of a formula, and was equipped with the means of an electric type as a means for its engagement and release can also be used.

[0043] Said output shaft 10 is connected with the change gear 11. This change gear 11 is for changing a change gear ratio and fluctuating driving torque, and various kinds of change gears, such as a change gear of the owner stage type constituted considering the epicyclic gear device as a subject, and an owner stage type change gear of the type which changes the connection relation of a rotation member according to a synchronous change-over device (synchronizer) etc., a belt-type nonstep variable speed gear, a toroidal-type nonstep variable speed gear, can be used for it. The belt-type nonstep variable speed gear 11 is typically shown in drawing 1.

[0044] This nonstep variable speed gear 11 arranges in parallel the driving pulley 12 and the follower pulley 13 which can change a flute width, it is the thing of a well-known configuration, the belt (not shown) to these pulleys 12 and 13 rolls it, and it changes a contact radius by changing the flute width of each pulleys 12 and 13, and it is constituted so that a change gear ratio may be changed continuously.

[0045] The counter shaft 14 is arranged in parallel with the follower pulley 13, and these follower pulley 13 and the counter shaft 14 are connected by one pair of counter gear 15 and 16. Moreover, other gears 17 attached in this counter shaft 14 have geared to the output gear 18. This output gear 18 is the ring wheel of differential equipment as an example.

[0046] An operation of the hybrid driving gear mentioned above next is explained. With the equipment concerning this invention mentioned above, it is a brake B1. And each clutch C1 and C2 If various kinds of transit (operation) modes are possible and this is shown in a table according to an engagement condition, it will be as drawing 2. In addition, in drawing 2 and this, and other drawings of the same kind, x mark shows a release (un-operating) condition, and O mark shows an engagement (actuation) condition. Hereafter, each operation mode is explained.

[0047] First, engine starting mode is explained. This mode is the mode which puts an engine 1 into operation by the idle state of a car, and is a brake B1. You make it engaged. That is, the ring wheel 5 of the epicyclic gear device 3 is fixed to casing 9. In addition, it adds to this and is the 2nd clutch C2. You may make it engaged and an output shaft 10 may be fixed. If a motor generator 2 is driven to an opposite direction with the hand of cut of an engine 1 in this condition and inverse rotation of the carrier 8 is carried out, a sun gear 4 will carry out forward rotation by fixing the ring wheel 5. That is, since the engine 1 connected with the sun gear 4 is made to carry out forward rotation, an engine 1 starts by starting supply of a fuel to coincidence, and lighting, if it is a gasoline engine.

[0048] This condition is shown in drawing 3 as a collinear Fig. In addition, in drawing 3 and this, and other drawings of the same kind, "S" shows a sun gear 4, "R" shows a ring wheel 5 and "CR" \*\* a

carrier 8. Moreover, the arrow head shows the direction of torque. Furthermore,  $\rho$  shows the ratio (gear ratio) of the number of teeth of a sun gear and a ring wheel. In drawing 3, if a carrier 8 is rotated in the direction of inverse rotation with a motor generator 2 where a ring wheel 5 is fixed, a sun gear 4 will be made to carry out forward rotation, and the engine 1 connected with the sun gear 4 will be started.

[0049] The ETC mode at the time of advance transit is explained below. This ETC mode is the mode as which the equipment mentioned above is operated as a torque converter, and is the 2nd above-mentioned clutch C2. You make it engaged and an output shaft 10 is connected with a ring wheel 5. In this mode, an engine 1 is operated in the for example most efficient condition, and to this, a motor generator 2 is driven so that the torque produced in a ring wheel 5 may become a thing in alignment with the demand of transit. The collinear Fig. showing this condition is as drawing 4, when the engine 1 is driving, forward torque has arisen in the sun gear 4, the torque of a negative direction is acting on a ring wheel 5 with the load for making it run a car to this, and the torque which a motor generator 2 outputs to a carrier 8 further is acting in the forward direction. If inverse rotation of the motor generator 2 is carried out in this condition, as the engine speed of a ring wheel 5 falls and the continuous line has shown to drawing 4 depending on the engine speed of a motor generator 2, the engine speed of a ring wheel 5 becomes zero, and it will be in the condition that the car stopped. That is, a car is maintainable to a idle state, driving an engine 1.

[0050] Moreover, since the engine speed of an engine 1 and the sun gear 4 of this and one is uniformly maintained if the output torque of the forward direction of a motor generator 2 is increased from the condition shown in drawing 4 as a continuous line and the engine speed is increased to a forward hand of cut (if the engine speed of the direction of inverse rotation is decreased), as a broken line shows to drawing 4, the ring wheel 5 which is an output element rotates in the forward direction. And the torque turns into torque which made the inputted torque amplify according to gear ratio  $\rho$  of the epicyclic gear device 3. That is, a magnification operation of torque arises. In other words, the assistant operation by the motor generator 2 arises.

[0051] Furthermore, motor mode is explained. This mode is the mode it runs only with the power of a motor generator 2, and is the 1st clutch C1. You make it engaged and a motor generator 2 is driven in that condition. In this condition, since it will be in the condition that the motor generator 2, the carrier 8, and the output shaft 10 were linked directly, the power of a motor generator 2 is transmitted to an output shaft 10 as it is, and can run with a motor generator 2.

[0052] Furthermore, engine motor (Eng+ motor) mode is explained. This mode is the so-called direct connection transit mode, and is the 1st clutch C1. The 2nd clutch C2 You make it engaged. These clutches C1 and C2 Since a carrier 8 and a ring wheel 5 are connected through an output shaft 10 by being engaged, the whole epicyclic gear device 3 is unified. Namely, an engine 1 and a motor generator 2 will be in the condition of having been directly linked with the output shaft 10. Therefore, the power outputted from the engine 1 and the motor generator 2 is inputted into a change gear 11 through an output shaft 10 as it is.

[0053] Below, the mode for go-astern transit is explained. Transit with the power of transit with the power of an engine 1, transit with the power of a motor generator 2, an engine 1, and a motor generator 2 is possible for go-astern transit. First, when engine mode is explained, in this mode, it is the 1st clutch C1. While making it engaged and connecting an output shaft 10 with a carrier 8, it is a brake B1. You make it engaged and a ring wheel 5 is fixed. The collinear Fig. showing this condition is as drawing 5, and if an engine 1 is driven, where a ring wheel 5 is fixed, when a sun gear 4 carries out forward rotation, a carrier 8 will carry out inverse rotation of it. That is, with the hand of cut of an engine 1, when an output shaft 10 rotates to an opposite direction, go-astern transit is carried out with the power of an engine 1.

[0054] Moreover, motor go-astern mode is the 1st clutch C1. You make it engaged. This is the same as that of the motor mode in the advance transit mentioned above, and since it will be directly linked with an output shaft 10 by the motor generator 2, an output shaft 10 carries out inverse rotation of it by carrying out inverse rotation of the motor generator 2. That is, go-astern transit is carried out with the



power of a motor generator 2.

[0055] In the engine motor (Eng+ motor) mode in go-astern transit, it is the 1st clutch C1. Brake B1 You make it engaged. Although this is in the same condition as the engine mode in go-astern transit and the output shaft 10 connected with a carrier 8 and this by driving an engine 1 carries out inverse rotation, since the motor generator 2 is always connected with the carrier 8, by driving a motor generator 2 in the direction of inverse rotation, the power is transmitted to an output shaft 10, and the driving force for go-astern transit increases. That is, driving force can be assisted with a motor generator 2.

[0056] Thus, in the hybrid driving gear shown in drawing 1 , in ETC mode, the torque outputted with the engine 1 can be amplified by inputting the torque of a motor generator 2 into the epicyclic gear device 3, and can be outputted to an output shaft 10. Moreover, rotation of an output shaft 10 can be stopped, driving an engine 1 by controlling the engine speed of a motor generator 2. Therefore, the epicyclic gear device 3 can be similarly operated with a torque converter.

[0057] Furthermore, when carrying out go-astern transit, the change gear which can run only with the power of an engine 1, therefore cannot set up an astern stage like the above-mentioned belt type nonstep variable speed gear as a change gear 11 can be adopted. And with the power of a motor generator 2, an engine 1 can be rotated and an engine 1 can be put into operation again. Therefore, the starter motor needed conventionally can be abolished in the above-mentioned hybrid driving gear.

[0058] It is the 2nd clutch C2 in the ETC mode in the case of the advance transit in the above-mentioned hybrid driving gear. In the case of go-astern transit connect an output shaft 10 with a ring wheel 5, and according to the power of an engine 1, it is the 1st clutch C1. An output shaft 10 is connected with a carrier 8. Thus, by changing the rotation element which connects an output shaft 10, the go-astern transit with the so-called ETC mode and the so-called engine 1 is attained, therefore they are each above-mentioned clutch C1 and C2. It is the so-called output switch clutch.

[0059] The example which materialized the hybrid driving gear mentioned above is shown in drawing 6 thru/or drawing 8 . The hybrid driving gear shown here has the front case 20, the mid case 21, and the rear case 22, and casing 23 is formed by these 3 person. The front case 20 is constituted so that it may connect with an engine, and the septum section 25 which has the through tube which made in agreement an engine output shaft 24 and an engine axis is formed in the interior. On both sides of this septum section 25, with the engine, covering 26 is attached in the opening edge of the opposite side, and the motor housing 27 is formed between this covering 26 and the septum section 25. The motor generator 28 is held in the interior of this motor housing 27.

[0060] The through tube which made said output shaft 24 and axis in agreement like the septum section 25 is formed in said covering 26, and Rota 30 is held free [ rotation ] by the bearing 29 which carried out fitting to the inner circumference section of these septa section 25, and the inner circumference section of covering 26. This Rota 30 attaches a permanent magnet in the periphery section of the flange projected outside by radial from the boss section supported by bearing 29, and the stator 31 is arranged in the location which counters by radial [ that / permanent magnet and radial ]. This stator 31 is being fixed to the inner skin of the front case 20. Moreover, the resolver 32 is arranged between the boss section of Rota 30, and the internal surface of covering 26. In addition, in order to secure the fluid-tight nature of a motor housing 27, as for said bearing 29, it is desirable that it is the bearing equipped with the sealant.

[0061] The centrum 33 of a fluid-tight structure is formed in the periphery side of said motor housing 27, and by pouring cooling water to this centrum 33, it is constituted so that a motor generator 28 may be cooled. That is, this centrum 33 serves as a water jacket.

[0062] The boss section of said Rota 30 is formed in the shape of a hollow shaft, and is inserted in the interior of the boss section free [ rotation of an input shaft 34 ]. This input shaft 34 penetrated said septum section 25, and has projected it to the engine side, and that protrusion edge is connected with the engine output shaft 24 through the drive plate 35. That is, a drive plate 35 is a large plate of the moment of inertia which enlarged mass by the side of a periphery, and is attached in the engine output shaft 24. Moreover, this drive plate 35 is equipped with the absorber device 36 in which it has elastic bodies, such as an arranged coil spring towards a hand of cut, and the boss section of that absorber device 36 has



fitted into the point of said input shaft 34 in one.

[0063] The septum section 37 which has the through tube which made the input shaft 34 and the axis in agreement in the mid case 21 connected with the above-mentioned front case 20 is formed in the pars intermedia in the direction of an axis. To the centrum currently formed between this septum section 37 and said covering 26, they are the epicyclic gear device 38 and a brake B1. And two clutches C1 and C2 It is contained.

[0064] This epicyclic gear device 38 is an epicyclic gear device of the double pinion mold mentioned above, adjoins said covering 26 and is arranged. The sun gear 39 in this epicyclic gear device 28 is formed in said input shaft 34 and one. Moreover, the boss section of said Rota 30 is prolonged in the epicyclic gear device 38 side along with the peripheral face of an input shaft 34, and spline fitting of the carrier 40 is carried out to the tip periphery section of the boss section (namely, hollow shaft section). The guide plate 41 which leads the lubricating oil which disperses in radial to a pinion gear side is attached in the side face by the side of the covering 26 of this carrier 40.

[0065] The retainer 43 which a ring wheel 42 is a cylinder-like member and supports this to the direction of an axis and radial is the inner skin of a ring wheel 42, and is connected with the end section in the direction of an axis. This retainer 43 is positioned to radial by being positioned to the direction of an axis by thrust bearing which it has been arranged between a carrier 40 and covering 26, and has been arranged between these carriers 40 and covering 26, and fitting into the boss section of a carrier 40 free [ rotation ].

[0066] The brake hub 44 which makes the shape of a cylinder is being fixed to the peripheral face of a ring gear 42 in one. The file plate of two or more sheets made [ this brake hub 44 ] to carry out spline fitting and the file plate which carried out spline fitting to the inner skin of the mid case 21 are arranged by turns in the direction of an axis, and it is a brake B1 by these file plates. It is constituted.

[0067] In a part for the intersection of said septum section 37 and inner skin of the mid case 21, it is a brake B1. The centrum which carried out opening towards the side is formed, and it is arranged so that a piston 45 may carry out longitudinal slide movement to this centrum in the direction of an axis. The point of this piston 45 is said brake B1. By having extended even in near, therefore supplying oil pressure to the tooth-back side of this piston 45, when a piston 45 moves rightward [ of drawing 6 ] and presses a file plate, it is a brake B1. It is constituted so that you may make it engaged.

[0068] In the inner circumference side of a piston 45, it is the 2nd clutch C2. The clutch drum 46 of \*\* is arranged. This clutch drum 46 is material cylinder-like centrum material which has the side-attachment-wall section in alignment with said septum section 37, and is held by the boss section of the septum section 37 free [ rotation ]. While the tip of said brake hub 44 carries out spline fitting, the file plate of two or more sheets is made to carry out spline fitting to the inner skin in the cylinder part of this clutch drum 46, and other file plates are arranged by turns among these file plates. A file plate besides these is the 1st clutch C1 arranged to the inner circumference side of the clutch drum 46. Spline fitting is carried out at the peripheral face of the clutch drum 47 of \*\*, therefore it is the 2nd clutch C2 by these file plates. It is constituted.

[0069] These file plates are pressed and it is the 2nd clutch C2. It is contained so that the piston 48 made engaged may carry out longitudinal slide movement to the inner circumference section of said clutch drum 46 in the direction of an axis. Supply of the oil pressure to the tooth-back side of this piston 48, i.e., the interior of the clutch drum 46, is constituted so that it may carry out through the oilway formed in said septum section 37. Furthermore, the return spring 49 held by the retainer is arranged at the front-face side (right-hand side in drawing 6) of this piston 48.

[0070] An output shaft 50 penetrates, it is held free [ rotation ] at the inner circumference side of the septum section 37, and the back end section (edge on the right-hand side of drawing 6) of this output shaft 50 has fitted into the point of said input shaft 34 free [ rotation ]. The flange projected to radial is formed in the edge by the side of the input shaft 34 in this output shaft 50, and said clutch drum 47 is connected here in one. Therefore, the 2nd clutch C2 It is constituted so that a ring gear 42 and an output shaft 50 may be connected alternatively.

[0071] This clutch drum 47 is the 1st clutch C1. It is \*\*, and spline fitting of the file plate of two or

more sheets is carried out to that inner skin, and these file plates and the file plate arranged by turns in the direction of an axis are made to carry out spline fitting to the peripheral face of the clutch hub 51 made to unite with said carrier 40. That is, it is the 1st clutch C1 by the file plate of \*\*\*\*\*. It is constituted. This 1st clutch C1 The piston 52 made engaged is held by the flange extended to radial [ of an output shaft 50 ]. The oil pressure which operates this piston 52 is constituted so that the tooth-back side of a piston 52 may be supplied through the interior of an output shaft 50 from said septum section 37. The return spring 53 which carries out return actuation of this piston 52 is arranged at the front-face side of a piston 52.

[0072] In addition, in the hybrid driving gear mentioned above, as shown in drawing 6 , while enlarging torque generated with a motor generator 28 by arranging Rota 30 and a stator 31 to a periphery side as much as possible, by making a part of epicyclic gear device 38 enter into the space section produced in the inner circumference side of a stator 31, a tooth space is used effectively and the dimension in the direction of an axis is shortened.

[0073] The change gear 54 is arranged at the centrum between the rear case 22 connected with the mid case 21, and said septum section 37. This change gear 54 is a belt-type nonstep variable speed gear, as mentioned above, and the driving pulley 55 is arranged on the same axis as an output shaft 50. This driving pulley 55 consists of a fixed sheave 56 and a movable sheave 57, the wall surface which these sheaves 56 and 57 counter is a taper side, and the slot which puts a belt 58 is formed of these taper sides. The fixed sheave 56 is equipped with the hollow-like shank, and is supported by said septum section 37 free [ rotation ] through the bearing 59 which carried out fitting to the periphery side of the end section of the shank, and the point of said output shaft 50 is inserted in the centrum, and spline fitting of it is carried out to it. The other-end section of the movable sheave 56 is held free [ rotation ] by the bearing 60 attached in the inner circumference section of the rear case 22. Fitting of the slide of the movable sheave 57 in the direction of an axis is made possible to the periphery side of the hollow shaft section in this fixed sheave 56. This movable sheave 57 is constituted so that it may be moved to the fixed sheave 56 side by the double piston type hydraulic servomechanism 61.

[0074] The follower pulley 62 is formed in parallel with the above-mentioned driving pulley 55. This follower pulley 62 consists of a fixed sheave 63 and a movable sheave 64 as well as a driving pulley 55, and it is constituted so that a belt 58 may be wrapped around the slot between each of these sheaves 63 and 64. The fixed sheave 63 has the shank in the air, and the edge (edge on the left-hand side of drawing 7 ) of one of these is held free [ rotation ] in the rear case 22 through bearing 65, and the other-end section is held by the septum section 37 free [ rotation ] through bearing 66. Fitting of the movable sheave 64 is carried out so that it can move in the direction of an axis at the periphery of the hollow shaft section in this fixed sheave 63. Between the hollow shaft sections of this movable sheave 64 and the fixed sheave 63, while moving the movable sheave 64 in the direction of an axis smoothly, in order to make it rotate in one with the fixed sheave 63, the ball spline 67 is formed. The hydraulic servomechanism 68 which presses the movable sheave 64 to the fixed sheave 63 side is formed in the tooth-back side (right-hand side of drawing 7 ) of this movable sheave 64.

[0075] Although control of the change gear ratio of this change gear 54 is performed by supplying oil pressure to each hydraulic servomechanisms 61 and 68, that control is the same as control by the conventional belt type nonstep variable speed gear almost. That is, the oil pressure according to demand torque is supplied to the hydraulic servomechanism 68 by the side of the follower pulley 62, and the oil pressure which sets up the change gear ratio demanded is supplied to the hydraulic servomechanism 61 by the side of a driving pulley 55 to this. That is, with the oil pressure by the side of the follower pulley 62, while giving predetermined tension to the belt 58, by making high oil pressure by the side of a driving pulley 55, the flute width of a driving pulley 55 becomes narrow, a belt 58 winds, and a credit radius becomes large, consequently a change gear ratio becomes small. If the oil pressure by the side of the drive pulley 55 is reduced contrary to this, since the flute width of a driving pulley 55 can extend with the tension concerning a belt 58, consequently a belt 58 will wind and a credit radius will become small, it is constituted so that a change gear ratio may become large.

[0076] Inside said output shaft 50 and the fixed sheave 56, the pump shaft 69 penetrated along with the

medial-axis line is arranged, and spline fitting of one edge of the pump shaft 69 is carried out to an input shaft 34. The chain sprocket 70 is attached in the point of this pump shaft 69. This chain sprocket 70 is for transmitting driving force to the oil pump which is not illustrated. Moreover, this chain 70 and chain which is not illustrated are covered with the end cover 71. Moreover, in drawing 7, a sign 72 is a parking gear and spline fitting is carried out to the fixed sheave 63 in the follower pulley 62.

[0077] Said front case 20 and mid case 21 are equipped with the part projected to radial, and the counter shaft 73 and the differential 74 are contained by the amount of the lobe. A counter shaft 73 is a comparatively short revolving shaft, and it is connected with the shank of the fixed sheave 63 in said follower pulley 62 by the counter gear 76 of a pair while holding the both ends free [ rotation ] by bearing 75. Moreover, other gearings 77 are formed in this counter shaft 73 at one, and this gearing 77 meshes with the ring gear 78 (output gear) in a differential 74. In addition, in drawing 6, a sign 79 shows a seal member and is changing the seal of between the septa 25 and input shafts 34 in the front case 20 into the fluid-tight condition.

[0078] If it is the configuration shown in drawing 6 thru/or drawing 8 mentioned above, the motor generator 28 with a large outer diameter will adjoin a drive plate 35, and it will be arranged, and it is a brake B1. A clutch C1 and C2 Since it is arranged at the nonstep variable speed gear 54 side, it has composition which the member which the outer-diameter dimension approximated is made to adjoin mutually, consequently can consider as equipment compact as a whole.

[0079] Other examples of this invention are explained below. The example shown in drawing 9 changes arrangement and connection relation of a configuration of being shown in drawing 1 mentioned above. That is, the engine 1 is always connected with the carrier 8, and the motor generator 2 is always connected with the sun gear 4 to this. Thus, it is the 1st clutch C1 by having changed from the configuration which shows the connection relation between an engine 1 and a motor generator 2 to drawing 1. It is arranged so that an output shaft 10 and a sun gear 4 may be connected alternatively. Moreover, a motor generator 2 sandwiches a change gear 11, and is each clutch C1 and C2. It is arranged in the opposite side. Therefore, the shaft which connects a motor generator 2 and a sun gear 4 has penetrated along with the medial-axis line of a driving pulley 12.

[0080] Also in the hybrid driving gear shown in drawing 9 also in the hybrid driving gear of a configuration of being shown in this drawing 9, the same transit mode (operation mode) is possible. That is, as shown in drawing 10, at engine starting mode, it is the 2nd clutch C2. Brake C1 You make it engaged. Therefore, since a sun gear 4 is made rotated with a motor generator 2 where a ring wheel 5 is fixed, a carrier 8 rotates to an opposite direction in a sun gear 4. The engine 1 connected with a carrier 8 and this carries out forward rotation by the collinear Fig.'s having shown this condition to drawing 11, and carrying out inverse rotation of the motor generator 2. Therefore, an engine 1 can be put into operation by supplying a fuel to an engine 1 in this condition, and lighting if needed.

[0081] The ETC mode in the case of advance transit is the 2nd clutch C2. It sets up by making it engaged. It is set up by this being the same as that of the example shown in drawing 1, and connecting with an output shaft 10 the rotation element with which the engine 1 or the motor generator 2 is not connected. Since the motor generator 2 and the engine 1 are connected with the sun gear 4 and carrier 8 which serve as a reaction force element mutually when the ring wheel 5 connected with the output shaft 10 is fixed in this condition An engine 1 for example, by operating in the most efficient condition and controlling the output of a motor generator 2 by the condition The torque which rotation of the output shaft 10 connected with a ring wheel 5 and this stopped, and amplified the output torque of an engine 1 to the output shaft 10 arises, and the epicyclic gear device 3 functions as a torque converter similarly. The collinear Fig. in this mode is shown in drawing 12.

[0082] Motor transit mode is the 1st clutch C1. You make it engaged and it sets up. That is, a motor generator 2 is connected with an output shaft 10 through a sun gear 4. Therefore, it can run with the power of a motor generator 2. In that case, the 2nd clutch C2 If you make it engaged, since the whole epicyclic gear device 3 will really rotate, the engine 1 connected with the carrier 8 carries out forward rotation. Therefore, an engine 1 can be started in motor transit mode.

[0083] The transit mode (Eng+ motor mode) by the engine 1 and the motor generator 2 is the mode

which is made to unify the whole epicyclic gear device 3, and links an engine 1 and a motor generator 2 with an output shaft 10 directly, and this is the 1st clutch C1 and the 2nd clutch C2. You make it engaged and it sets up. It is the same as that of the engine motor mode in the equipment shown in drawing 1.

[0084] At the time of go-astern, it can run with both an engine 1, and both [ either or ] 2. That is, when carrying out go-astern transit under the power of an engine 1, it is the 1st clutch C1. And brake B1 It is made to be engaged, and while fixing a ring wheel 5, where a sun gear 4 is connected with an output shaft 10, forward rotation of the carrier 8 is carried out with an engine 1. Consequently, since the output shaft 10 connected with a sun gear 4 and this carries out inverse rotation as a collinear Fig. is shown in drawing 13, go-astern transit will be carried out.

[0085] Moreover, since what is necessary is just to link a motor generator 2 with an output shaft 10 directly when carrying out go-astern transit with a motor generator 2, it is the 1st clutch C1. You make it engaged. Moreover, it is the 2nd clutch C2 in that case. It is made to engage with coincidence and you may make it not produce relative rotation of the rotation elements in the epicyclic gear device 3. This is the same also in the equipment shown in drawing 1.

[0086] When carrying out go-astern transit under the power of both an engine 1 and the motor generator 2, it is the 1st clutch C1. Brake B1 You make it engaged. Since a carrier 8 is rotated with an engine 1 where this was the same as that of the engine mode at the time of go-astern transit and a ring wheel 5 is fixed, the output shaft 10 connected with a sun gear 4 and this will carry out inverse rotation, and will be in a go-astern run state. In that case, go-astern transit can be carried out with the power of an engine 1 and a motor generator 2 by carrying out inverse rotation of the motor generator 2, and adding the torque of the direction of inverse rotation to a sun gear 4.

[0087] Thus, in the hybrid driving gear constituted as shown in drawing 9, since go-astern transit can be carried out with the power of an engine 1, even if it is the case where the charge capacity of a dc-battery (not shown) is falling, the driving force in the case of go-astern transit is not insufficient. Moreover, since the torque which the so-called ETC mode is possible and an engine 1 outputs can be amplified with a motor generator 2 and it can output from an output shaft 10, sufficient driving torque required at the time of start etc. can be acquired, maintaining an engine 1 to the optimal operational status.

Moreover, especially with the configuration shown in drawing 9, since a motor generator 2 can be arranged in the end section in the direction of an axis, cooling of a motor generator 2 becomes easy.

[0088] With the configuration shown in this drawing 9, a carrier 8 always carries out forward rotation so that it may be known from the above-mentioned explanation. This is used and it is an oil pump Op. It can consider as the built-in configuration. The example is shown in drawing 14. The configuration shown in this drawing 14 improves the configuration shown in drawing 9, and is an oil pump Op to a carrier 8. While being connected, it is a clutch C0 between a carrier 8 and an engine 1. It is arranged and is a brake B1 further. It is an one way clutch F1 to juxtaposition. It is arranged. Other configurations are the same as the configuration shown in drawing 9.

[0089] Even if it is in which transit mode of advance and go-astern, when a carrier 8 carries out forward rotation with such a configuration, it is an oil pump Op. It can drive normally and required oil pressure can be generated.

[0090] Each example mentioned above may be constituted although it is the example constituted so that an output element might be changed, in addition so that the element which inputs the power of a motor generator 2 may be changed. The example is indicated to drawing 15. The example shown in this drawing 15 improves the configuration shown in drawing 1, and is the 1st input clutch C1 between a motor generator 2 and a ring wheel 5. It is arranged. Moreover, it is the 2nd input clutch C2 between a motor generator 2 and a carrier 8. It is arranged. Further between a carrier 8 and an output shaft 10 The 1st output clutch C3 equivalent to the 1st clutch shown in drawing 1 The 2nd output clutch C4 equivalent to the 2nd clutch which it is arranged and is shown between a ring wheel 5 and an output shaft 10 at drawing 1 It is arranged. Furthermore, it changes to the brake shown in drawing 1, and is an one way clutch F1. It is arranged between a ring wheel 5 and casing 9.

[0091] It explains, the operation of a hybrid driving gear, i.e., each transit mode, shown in this drawing

15 . When according to this hybrid driving gear the seven modes shown in drawing 16 can be set up and engine starting mode is explained first, in this mode, it is the 2nd input clutch C2. You make it engaged. That is, a motor generator 2 is connected with a carrier 8. The collinear Fig. of this condition is shown in drawing 17 . If inverse rotation of the carrier 8 is carried out with a motor generator 2, since the load of an engine 1 is applied to the sun gear 4, a ring wheel 5 tends to carry out inverse rotation. One way clutch F1 connected with this ring wheel 5 Since it is constituted so that it may be engaged, when the torque of the direction of inverse rotation acts on the member by the side of rotation (for example, inner race), the engine 1 which a ring wheel 5 is fixed, consequently has been connected with a sun gear 4 and this carries out forward rotation by carrying out inverse rotation of the motor generator 2. Therefore, an engine 1 can be put into operation by supplying a fuel to an engine 1 in the condition, and lighting if needed. In addition, at this engine starting mode, it is the 2nd output clutch C4. You may make it engaged and rotation of an output shaft 10 may be stopped.

[0092] Moreover, the ETC mode in the case of advance transit is the 2nd input clutch C2. The 2nd output clutch C4 You make it engaged and it sets up. That is, a motor generator 2 is connected with a carrier 8, and an output shaft 10 is connected with a ring wheel 5. This will be in the same connection condition as the ETC mode in the case of advance transit with the hybrid driving gear shown in drawing 1 , and the I/O condition of power. Therefore, rotation of an output shaft 10 can be stopped, being able to amplify the torque which an engine 1 outputs with a motor generator 2, and being able to output to an output shaft 10, and rotating an engine 1 so that clearly also from the collinear Fig. shown in drawing 18 .

[0093] Moreover, motor transit mode is the 2nd input clutch C2. The 1st output clutch C3 You make it engaged and it sets up. That is, while connecting a motor generator 2 with a carrier 8, a motor generator 2 and an output shaft 10 are directly linked through a carrier 8 by connecting an output shaft 10 with a carrier 8. Therefore, advance transit can be carried out with the power of a motor generator 2.

[0094] Any three of said four clutches are made engaged in engine motor mode. For example, as shown in drawing 16 , they are each input clutch C1 and C2. The 1st output clutch C3 You make it engaged. Therefore, while a motor generator 2 is connected with the epicyclic gear device 3, the whole epicyclic gear device 3 is unified and an output shaft 10 is connected with the carrier 8 of the unified epicyclic gear device 3. Therefore, the power of an engine 1 and a motor generator 2 is transmitted to an output shaft 10 through the epicyclic gear device 3, and can carry out advance transit with the power of an engine 1, and the power of a motor generator 2.

[0095] Engine mode and motor mode are possible as the mode for go-astern transit. In engine mode, it is the 1st input clutch C1. The 1st output clutch C3 You make it engaged. That is, while connecting a motor generator 2 with a ring wheel 5, an output shaft 10 is connected with a carrier 8. The collinear Fig. of this condition is shown in drawing 19 . If an engine 1 is driven and the torque of a forward hand of cut is transmitted to a sun gear 5, since the load from an output shaft 10 is applied to the carrier 8, the torque of a forward hand of cut arises in a ring wheel 5. If the torque which overcomes this is given to a ring wheel 5 with a motor generator 2, the rotational frequency of a ring wheel 5 will be controlled and the output shaft 10 connected with a carrier 8 and this in connection with it will carry out inverse rotation. In addition, in a ring wheel 5, it is an one way clutch F1. Since it has connected, it is an one way clutch F1. It is possible to reduce rotation of the forward hand of cut of a ring wheel 5 until rotation is stopped. That is, the engine mode in the case of this go-astern transit will set up a go-astern run state with a motor generator 2, and will control that driving torque by the motor generator 2.

[0096] On the other hand, the motor mode for go-astern transit is the mode which links a motor generator 2 with an output shaft 10 directly, therefore is the 2nd input clutch C2 like the motor mode in the case of advance transit. The 1st output clutch C3 You make it engaged. In this condition, since a motor generator 2 and an output shaft 10 are in a direct connection condition, by carrying out inverse rotation of the motor generator 2, an output shaft 10 carries out inverse rotation, and carries out go-astern transit.

[0097] In addition, the example shown in above-mentioned drawing 15 can be performed about the configuration which shows the same modification as this to drawing 9 , although it is the example which

carried out additional installation of the clutch device among configurations of being shown in drawing 1 between a carrier 8 and a motor generator 2 and between the ring wheel 5 and the motor generator 2, and changed the brake into the one way clutch. That is, since the means which separates a motor generator 2 from the epicyclic gear device 3 will be established, when it runs under the power of an engine 1 and there is no need for a generation of electrical energy, a motor generator 2 can be separated and loss of power can be prevented.

[0098] The example which changed to said double pinion mold epicyclic gear device next, and used the single pinion mold epicyclic gear device is explained. Drawing 20 shows the example and the single pinion mold epicyclic gear device 80 in which compound and the power of an engine 1 and a motor generator 2 is individually transmitted to an output shaft 10 is a gearing device which used as the rotation element the carrier 84 which held the pinion gear 83 which geared to the sun gear 81 which is an external-tooth gearing, the ring wheel 82 which is the internal gear arranged on a concentric circle to the sun gear 81, and these sun gears 81 and a ring wheel 82 free [ rotation and revolution ].

[0099] While a motor generator 2 is connected with the sun gear 81, it is the 1st clutch C1. It minds and the output shaft 10 is connected. Moreover, the engine 1 is connected with the ring wheel 82.

Furthermore, brake B1 which fixes a carrier 84 alternatively While being prepared, the 2nd clutch C2 is formed between this carrier 84 and output shaft 10. That is, the configuration shown in this drawing 20 changes into a single pinion mold epicyclic gear device the double pinion mold epicyclic gear device in the configuration shown in drawing 9 mentioned above, and replaces the connection relation between a power plant or friction engagement equipment in a carrier and a ring wheel in connection with it.

[0100] Therefore, also in the hybrid driving gear of a configuration of being shown in drawing 20, the same transit mode as the equipment of a configuration of being shown in drawing 9 can be set up, and they are the clutch C1 in each mode, and C2. And brake B1 Engagement / release condition is the same as that of the equipment shown in drawing 9. The engagement actuation table for setting each transit mode as drawing 21 is shown. In addition, at drawing 21, it is the 2nd clutch C2 in the motor mode in the case of advance transit and go-astern transit. It is the 2nd clutch C2 like the case where it is based on the equipment shown in drawing 9 since the whole epicyclic gear device 80 unifies in motor mode although released. It is good also as making it engaged.

[0101] Hereafter, each transit mode is explained. At engine starting mode, it is the 2nd clutch C2. Brake B1 You make it engaged. Therefore, since a sun gear 81 is made rotated with a motor generator 2 where a carrier 84 is fixed, a ring wheel 82 rotates to an opposite direction in a sun gear 81. The engine 1 connected with a ring wheel 82 and this carries out forward rotation by the collinear Fig.'s having shown this condition to drawing 22, and carrying out inverse rotation of the motor generator 2. Therefore, an engine 1 can be put into operation by supplying a fuel to an engine 1 in this condition, and lighting if needed.

[0102] The ETC mode in the case of advance transit is the 2nd clutch C2. It sets up by making it engaged. That is, the rotation element with which the engine 1 or the motor generator 2 is not connected is connected with an output shaft 10. Since the motor generator 2 and the engine 1 are connected with the sun gear 81 and ring wheel 82 which serve as a reaction force element mutually when the carrier 84 connected with the output shaft 10 is fixed in this condition An engine 1 for example, by operating in the most efficient condition and controlling the output of a motor generator 2 by the condition The torque which rotation of the output shaft 10 connected with a carrier 84 and this stopped, and amplified the output torque of an engine 1 to the output shaft 10 arises, and the epicyclic gear device 80 functions as a torque converter similarly. The collinear Fig. in this mode is shown in drawing 23.

[0103] Motor transit mode is the 1st clutch C1. You make it engaged and it sets up. That is, a motor generator 2 is connected with an output shaft 10. Therefore, it can run with the power of a motor generator 2.

[0104] The transit mode (Eng+ motor mode) by the engine 1 and the motor generator 2 is the mode which is made to unify the whole epicyclic gear device 80, and links an engine 1 and a motor generator 2 with an output shaft 10 directly, and this is the 1st clutch C1. And the 2nd clutch C2 You make it engaged and it sets up. It is the same as that of the engine motor mode in the equipment shown in



drawing 1 or drawing 9 .

[0105] At the time of go-astern, it can run with both an engine 1, and both [ either or ] 2. That is, when carrying out go-astern transit under the power of an engine 1, it is the 1st clutch C1. And brake B1 It is made to be engaged, and while fixing a carrier 84, where a sun gear 81 is connected with an output shaft 10, forward rotation of the ring wheel 82 is carried out with an engine 1. Consequently, since the output shaft 10 connected with a sun gear 81 and this carries out inverse rotation as the collinear Fig. is shown in drawing 24 , go-astern transit will be carried out.

[0106] Moreover, since what is necessary is just to link a motor generator 2 with an output shaft 10 directly when carrying out go-astern transit with a motor generator 2, it is the 1st clutch C1. You make it engaged. Moreover, it is the 2nd clutch C2 in that case. It is made to engage with coincidence and you may make it not produce relative rotation of the rotation elements in the epicyclic gear device 80.

[0107] When carrying out go-astern transit under the power of both an engine 1 and the motor generator 2, it is the 1st clutch C1. Brake B1 You make it engaged. Since a ring wheel 82 is rotated with an engine 1 where this was the same as that of the engine mode at the time of go-astern transit and a carrier 84 is fixed, the output shaft 10 connected with a sun gear 81 and this will carry out inverse rotation, and will be in a go-astern run state. In that case, go-astern transit can be carried out with the power of an engine 1 and a motor generator 2 by carrying out inverse rotation of the motor generator 2, and adding the torque of the direction of inverse rotation to a sun gear 81.

[0108] Thus, in the hybrid driving gear constituted as shown in drawing 20 , since go-astern transit can be carried out with the power of an engine 1, even if it is the case where the charge capacity of a dc-battery (not shown) is falling, the driving force in the case of go-astern transit is not insufficient. Moreover, since the torque which the so-called ETC mode is possible and an engine 1 outputs can be amplified with a motor generator 2 and it can output from an output shaft 10, sufficient driving torque required at the time of start etc. can be acquired, maintaining an engine 1 to the optimal operational status.

[0109] It is an oil pump Op to the configuration shown in drawing 20 . The added configuration is shown in drawing 25 . It is [ a ring wheel 82, that of an engine 1, and ] a clutch C0 in between. It is arranged and is an oil pump Op to the output shaft of the engine 1. It is connected. Moreover, brake B1 It is an one way clutch F1 to juxtaposition. It is arranged. Other configurations are the same as the configuration shown in drawing 20 .

[0110] In addition, in the example shown in drawing 20 , a motor generator 2 is arranged in the center section in the direction of an axis, and they are the epicyclic gear device 3, a clutch C1, and C2 to the both sides. Although considered as the arranged configuration, a change gear 11 is adjoined and a motor generator 2 is arranged, and they are a clutch C1 and C2. It is better than the epicyclic gear device 3 also as a configuration arranged to an engine 1 side.

[0111] It constitutes so that it may be possible to carry out go-astern transit with the power of an engine 1 by changing with a clutch the rotation element which connects an output shaft 10, but by changing the method of an input of power over an epicyclic gear device, each example explained above can also be constituted so that go-astern transit with an engine 1 may be possible. The example is explained below.

[0112] Drawing 26 is the example which used the RABINIYO mold epicyclic gear device 90. This RABINIYO mold epicyclic gear device 90 The 1st sun gear 91 which is an external-tooth gearing, and the ring wheel 92 which is the internal gear arranged on a concentric circle to this 1st sun gear 91, The carrier 95 which held the long pinion gear 94 which geared to the Short pinion gear 93 which gears to the 1st sun gear 91 arranged among these sun gears 91 and ring wheels 92, and this Short pinion gear 93 and ring wheel 92 free [ rotation and revolution ], It is the well-known epicyclic gear device equipped with the 2nd sun gear 96 which got into gear to the long pinion gear 94. The 1st clutch C1 which connects an engine 1 with the 1st sun gear 91 alternatively while a motor generator 2 is connected with the 2nd sun gear 96 The 2nd clutch C2 which connects an engine 1 with the 2nd sun gear 96 alternatively is formed. Furthermore, a brake B1 is formed between a carrier 95 and casing 9, and it is this brake B1. It is constituted so that a carrier 95 may be fixed alternatively. Furthermore, the output shaft 10 is connected with the ring wheel 92.



[0113] On the other hand, between the follower pulley 13 and casing 9, it is an one way clutch F1. 2nd brake B-2 It is arranged by the serial. This one way clutch F1 The member (for example, inner race) connected with the follower pulley 13 is 2nd brake B-2 in the follower pulley 13. It is constituted so that it may be engaged, when it rotates in the go-astern transit direction to a near member (for example, outer race) (inverse rotation). Therefore, 2nd brake B-2 By making it engaged, it is constituted so that the rotation to the go-astern transit direction of the follower pulley 13, a driving pulley 12, and an output shaft 10 may be prevented. Since other configurations are the same as the configuration shown in drawing 1 , they give the same sign as drawing 1 to drawing 26 , and omit the explanation.

[0114] Each transit mode (operation mode) shown in drawing 27 also in the hybrid driving gear of a configuration of being shown in this drawing 26 is possible. Hereafter, each of these modes are explained.

[0115] At engine starting mode, it is the 1st clutch C1. While making it engaged and connecting an engine 1 with the 1st sun gear 91, it is 2nd brake B-2. It considers as the condition of having made it engaged and having prevented the inverse rotation of an output shaft 10 92, i.e., a ring wheel. The collinear Fig. of this condition is shown in drawing 28 . In addition, it sets to the following collinear Figs. and is rho 1. The ratio of the number of teeth of the 1st sun gear and a ring wheel, and rho 2 The ratio of the number of teeth of the 2nd sun gear and a ring wheel is shown, respectively, and it is S1. The 1st sun gear and S2 The 2nd sun gear is shown, respectively. Since inverse rotation of the 2nd sun gear 96 will be carried out where a ring wheel 92 is fixed when inverse rotation of the motor generator 2 is carried out, the 1st sun gear 91 rotates to an opposite direction to this 2nd sun gear 96. That is, since the engine 1 connected with the 1st sun gear 91 is made to carry out forward rotation with a motor generator 2, an engine 1 can be put into operation by supplying a fuel to an engine 1 and lighting if needed.

[0116] The ETC mode as which the epicyclic gear device 90 is similarly operated with a torque converter in the case of advance transit is possible. This is the 1st clutch C1. You make it engaged and an engine 1 is connected with the 1st sun gear 91. This condition serves as a configuration which connected the engine 1 and the motor generator 2 with the 2nd sun gear, the rotation element 91, i.e., 1st sun gear, which rotates to an opposite direction mutually, 96, when the ring wheel 92 which is the output element connected with an output shaft 10 and this is fixed. The collinear Fig. in this case is shown in drawing 29 . If a motor generator 2 is driven in the direction of inverse rotation in the condition of operating an engine 1 in the for example most efficient condition, and transmitting the power to the 1st sun gear 91 and inverse rotation of the 2nd sun gear 96 is carried out, according to the rotational frequency of the motor generator 2, rotation of a ring wheel 92 and the output shaft 10 of this and one will stop. The continuous line has shown the condition to drawing 29 .

[0117] if the output torque of the forward hand of cut of a motor generator 2 is increased from this condition, according to it, the rotational frequency (rotational frequency of a forward hand of cut) of the 2nd sun gear 96 will increase gradually (namely, the rotational frequency of the direction of inverse rotation -- gradually -- falling), and the rotational frequency to the forward hand of cut of the output shaft 10 connected with a ring wheel 92 and this in connection with it will increase gradually. Since the engine speed of the output shaft 10 is small as compared with the engine speed of an engine 1, the output torque turns into torque which amplified the output torque of an engine 1 with the motor generator 2. Thus, also in the hybrid driving gear of a configuration of being shown in drawing 26 , the epicyclic gear device 90 can be operated as a torque converter.

[0118] The motor mode in advance transit is the 1st brake B1. It sets up by making it engaged and fixing a carrier 95. In this condition, since the 2nd sun gear 96 and a ring wheel 92 serve as relation mutually rotated to an opposite direction, if inverse rotation of the motor generator 2 is carried out, a ring wheel 92 and the connected output shaft 10 will carry out forward rotation. That is, with the power of a motor generator 2, an output shaft 10 can be rotated and advance transit can be carried out. In addition, since the follower pulley 13 rotates in the advance transit direction in this case, it is an one way clutch F1. It is not engaged, therefore is 2nd brake B-2. You may make it engaged.

[0119] Engine motor mode is the mode in which the power of the power motor generator 2 of an engine 1 is transmitted to an output shaft 10, therefore is the 1st clutch C1 in this case. The 2nd clutch C2 You

make it engaged. The 1st sun gear 91 and the 2nd sun gear 96 which are two rotation elements are a clutch C1 and C2. Since it is connected, the whole epicyclic gear device 90 is unified. Consequently, the power of an engine 1 and the power of a motor generator 2 are outputted to an output shaft 10 from a ring wheel 92 as it is.

[0120] If the three modes at the time of performing go-astern transit are possible and engine mode is explained first, when carrying out go-astern transit with the power of an engine 1, it is the 2nd clutch C2. While you make it engaged and an engine 1 is connected with the 2nd sun gear 96, it is a brake B1. You make it engaged and a carrier 95 is fixed. Since the collinear Fig. of this condition is shown in drawing 30, and it will be connected by an engine 1 and the output shaft 10 through a single pinion mold epicyclic gear device, therefore a carrier 95 is fixed and the 2nd sun gear 96 is made rotated with an engine 1, the output shaft 10 connected with a ring wheel 92 and this carries out inverse rotation, and carries out go-astern transit. In addition, one way clutch F1 connected with the follower pulley 13 since a ring wheel 92 carries out inverse rotation as shown in drawing 30 in this case It is engaged. However, this one way clutch F1 2nd brake B-2 which has a serial relation Since it has released, equipment does not lock.

[0121] The motor mode in the case of go-astern transit is the 1st brake B1. You make it engaged and it sets up. That is, the epicyclic gear device 90 is operated as a single pinion mold epicyclic gear device by the long pinion gear 94, the carrier 95, and ring wheel 92 which have geared with the 2nd sun gear 96 to this. The carrier 95 is a brake B1. Since it is fixed, if forward rotation of the motor generator 2 is carried out, when the 2nd sun gear 96 connected with this carries out forward rotation, a ring wheel 92 will carry out inverse rotation. Therefore, since an output shaft 10 carries out inverse rotation with the power of a motor generator 2, go-astern transit can be performed. In addition, when the follower pulley 13 rotates in the go-astern transit direction in that case, it is an one way clutch F1. Although engaged, it is 2nd brake B-2. Since it is released, equipment does not lock.

[0122] The engine motor mode in the case of go-astern transit is the 2nd clutch C2. While making it engaged and connecting an engine 1 with the 2nd sun gear 96, it is a brake B1. It sets up by making it engaged and fixing a carrier 95. In the motor mode in the go-astern transit mentioned above, become the mode which inputs the power of an engine 1 into the 2nd sun gear 96 in addition to the power of a motor generator 2, the 2nd sun gear 96 is made to carry out forward rotation with the power of the these engines 1 and motor generator 2 which followed, and a ring wheel 92 is made to carry out inverse rotation of this condition with the torque according to it, consequently an output shaft 10 carries out inverse rotation, and it turns into a go-astern run state. In addition, it is an one way clutch F1 also in this case. It is engaged.

[0123] Thus, making one of friction engagement equipments slip, and maintaining a stop condition, before connecting an engine 1, and starting an engine 1 or starting go-astern transit, after starting go-astern transit with a motor generator 2, since a motor generator 2 and an engine 1 can be connected when carrying out go-astern transit, start an engine 1, friction engagement equipment is made completely engaged after that with a motor generator 2, and go-astern transit is started.

[0124] Also in the hybrid driving gear shown in drawing 26, while being able to operate the epicyclic gear device 90 with a torque converter similarly in the case of advance transit and being able to aim at magnification of an output torque, with the engine 1 operated, rotation of an output shaft 10 can be stopped and it can stop. moreover -- even if it is the case where can carry out go-astern transit with the power of an engine 1, therefore the charge capacity of a dc-battery (not shown) is falling by changing the method of the input from an engine 1 over the epicyclic gear device 90 -- the need -- go-astern transit can be carried out with sufficient driving force. With the hybrid driving gear of a configuration of being shown furthermore in drawing 26, they are each clutch C1 and C2. Since it is for transmitting the power of an engine 1 to sun gears 91 and 96, they are the clutch C1 and C2. The transfer torque capacity demanded does not exceed the torque which an engine 1 outputs, therefore is these C1 and C2. The whole equipment can be miniaturized as a thing of small capacity.

[0125] The example which used the RABINIYO mold epicyclic gear device in which the configuration of a long pinion was changed next is explained. Drawing 31 shows the example and its number of teeth

of the long pinion in the RABINIYO mold epicyclic gear device 100 shown here has increased in the part which gears to the 2nd sun gear. That is, this RABINIYO mold epicyclic gear device 100 is equipped with the carrier 105 which held the long pinion gear 104 which gears like what is shown in drawing 26 mentioned above to the Short pinion gear 103 which gears to the 1st sun gear 101, and this Short pinion gear 103 and ring wheel 102 free [ rotation and revolution ], and the 2nd sun gear 106 which got into gear to that long pinion gear 104. [ the 1st sun gear 101, a ring wheel 102, and ] And the outer diameter of the part where the 2nd sun gear 106 has got into gear among the long pinion gears 104 is larger than the outer diameter of the part which has geared with the ring wheel 102, and the number of teeth of this part has increased.

[0126] And the 1st clutch C1 which connects an engine 1 alternatively to the 1st sun gear 101 While being prepared, a motor generator 2 is connected with the 2nd sun gear 106, and it is the 2nd clutch C2 between the 2nd sun gear 106 of a parenthesis, and a carrier 105. It is arranged. The 1st brake B1 which the output shaft 10 is furthermore connected with the carrier 105, and fixes this carrier 105 alternatively 2nd brake B-2 which fixes a ring wheel 102 alternatively It is prepared. Since other configurations are the same as the configuration shown in drawing 1 , they give the same sign as drawing 1 to drawing 31 , and omit the explanation.

[0127] The transit mode (operation mode) which can be set up with the hybrid driving gear shown in this drawing 31 is as being shown in drawing 32 . First, if engine starting mode is explained, when putting an engine 1 into operation, it is the 1st clutch C1. While making it engaged and connecting an engine 1 with the 1st sun gear 101, it is the 1st brake B1. You make it engaged and a carrier 105 is fixed. The collinear Fig. of this condition is as being shown in drawing 33 . In addition, it is rho 3 in the following collinear Figs. It is the ratio of the number of teeth of the part which has geared to said 1st pinion gear 103 of said 2nd pinion gear 104, and the number of teeth of the part which has geared to said 2nd sun gear 106. If inverse rotation of the 2nd sun gear 106 is carried out with a motor generator 2 where a carrier 105 is fixed, the 1st sun gear 101 which has connected the engine 1 will carry out forward rotation. That is, since an engine 1 is made to carry out forward rotation, an engine 1 can be put into operation by supplying a fuel to an engine 1 in this condition, and lighting if needed.

[0128] In case advance transit is carried out, three transit modes are possible like the equipment shown in drawing 26 mentioned above. First, when the ETC mode as which the epicyclic gear device 100 is similarly operated with a torque converter is explained, it is the 1st clutch C1 in this case. You make it engaged. The collinear Fig. of the condition is shown in drawing 34 . Namely, it will be in the condition that the engine 1 and the motor generator 2 were connected with the 1st sun gear 101 and the 2nd sun gear 106 used as the relation rotated to an opposite direction mutually [ when the carrier 105 of an output shaft 10 and one is fixed ]. Therefore, if an engine 1 is operated in the for example most efficient condition and inverse rotation of the motor generator 2 is carried out at a predetermined engine speed in the condition, as a continuous line shows to drawing 34 , rotation of an output shaft 10 stops, and a stop condition can be maintained, with the engine 1 operated. If the rotational frequency of a motor generator 2 is changed from this condition to a forward hand of cut (i.e., if the rotational frequency of the direction of inverse rotation is decreased and forward rotation is carried out gradually), the torque of a forward hand of cut will arise in an output shaft 10, and that rotational frequency will increase gradually. In that case, the torque of an output shaft 10 turns into torque amplified rather than the output torque of an engine 1. That is, driving torque is made to amplify with the power which a motor generator 2 outputs, driving an engine 1. Therefore, it becomes motor assistant mode.

[0129] The motor mode at the time of advance transit is the 2nd clutch C2. It sets up as a condition which was made engaged and linked the motor generator 2 with the output shaft 10 directly through the carrier 105. Therefore, since the power of a motor generator 2 is transmitted to an output shaft 10 as it is, it can run with the power of a motor generator 2.

[0130] The engine motor mode in the case of advance transit is the 1st clutch C1. The 2nd clutch C2 You make it engaged and it sets up. Namely, the 2nd clutch C2 Since the 2nd sun gear 106 and a carrier 105 are connected by making it engaged, the whole epicyclic gear device 100 is unified. Furthermore, it is the 1st clutch C1. Since it is engaged, and it is unified and the engine 1 is connected with the 1st sun

gear 101 of the epicyclic gear device 100, an engine 1 and a motor generator 2 will be in the condition of having been directly linked with the output shaft 10. Therefore, the power of an engine 1 and a motor generator 2 can be transmitted to an output shaft 10 as it is, and advance transit can be carried out.

[0131] Also when carrying out go-astern transit, three transit modes (operation mode) are possible. First, if engine mode is explained, when the power of an engine 1 will perform go-astern transit, it is the 1st clutch C1. 2nd brake B-2 You make it engaged. That is, while connecting an engine 1 with the 1st sun gear 101, a ring wheel 102 is fixed. If forward rotation of the 1st sun gear 101 is carried out with an engine 1 where the collinear Fig. of this condition is shown in drawing 35 and a ring wheel 102 is fixed, the output shaft 10 connected with a carrier 105 and this can carry out inverse rotation, therefore go-astern transit can be carried out with the power of an engine 1.

[0132] The motor mode in the case of go-astern transit is 2nd brake B-2. You make it engaged and it sets up. In this mode, since power is inputted only into the 2nd sun gear 106 from a motor generator 2 and the ring wheel 102 is being fixed in that condition, the output shaft 10 connected with a carrier 105 and this carries out inverse rotation. In that case, ratio rho 2 of the number of teeth of the 2nd sun gear 106 and a ring wheel 102 (namely, gear ratio) Since it responds and the rotational frequency of a carrier 105 is decreased, the output torque produced in an output shaft 10 is increased according to the gear ratio, therefore the change gear ratio at the time of go-astern with motor mode can be set as a large value.

[0133] The engine motor mode which carries out go-astern transit with an engine 1 and a motor generator 2 is the 1st clutch C1. 2nd brake B-2 You make it engaged and it sets up. That is, while connecting an engine 1 with the 1st sun gear 101, a ring wheel 102 is fixed. In this condition, since a carrier 105 will carry out inverse rotation if the torque of the direction of inverse rotation acts on a carrier 105 and the power of a forward hand of cut is inputted into the 2nd sun gear 106 like this with the power inputted into the 1st sun gear 101, the power of an engine 1 and a motor generator 2 can be compounded according to the epicyclic gear device 100, and it can transmit to an output shaft 10. That is, with the power of an engine 1 and a motor generator 2, inverse rotation of the output shaft 10 can be carried out, and go-astern transit can be carried out.

[0134] yes it is indicated to drawing 31 that mentioned above -- while the function as the so-called torque converter which is made to amplify the output torque of an engine 1 and is outputted to an output shaft 10 also in a Brit driving gear can be attained, even if it is the case where can carry out go-astern transit with an engine 1, therefore the charge capacity of a dc-battery (not shown) is falling -- the need -- it is possible to carry out go-astern transit with sufficient driving force.

[0135] Furthermore, it also sets to the hybrid driving gear of a configuration of being shown in this drawing 31, and they are each clutch C1 and C2. It is arranged so that the power which an engine 1 or a motor generator 2 outputs may be transmitted, and since the torque amplified by the gearing device etc. is not transmitted, that transfer torque capacity may be small, consequently can form the whole equipment into small lightweight.

[0136] Although each example explained above is an example which used 1 set of epicyclic gear devices, with the equipment of this invention, two or more sets of epicyclic gear devices can be used. Hereafter, the example is explained.

[0137] The hybrid driving gear shown in drawing 36 is the example which used 2 sets of single pinion mold epicyclic gear devices 110,111 which connected two rotation elements of each other, and these epicyclic gear devices 110,111 use as a rotation element the ring wheel 114,115 arranged on a concentric circle to a sun gear 112,113 and a sun gear 112,113, respectively, and the carrier 116,117 which held the pinion gear which geared to the sun gear 112,113 and the ring wheel 114,115 free [ rotation and revolution ]. And the carrier 116 of the 1st epicyclic gear device 110 and the ring wheel 115 of the 2nd epicyclic gear device 111 are connected in one, and the ring wheel 114 of the 1st epicyclic gear device 110 and the carrier 117 of the 2nd epicyclic gear device 111 are connected in one.

[0138] The 1st one way clutch F1 engaged between this sun gear 113 and the sun gear 112 of the 1st epicyclic gear device 110 in case torque is transmitted to the 1st epicyclic gear device 110 side from the 2nd epicyclic gear device 111 side in a forward hand of cut while a motor generator 2 is connected with

the sun gear 112 of that 2nd epicyclic gear device 111 The 1st clutch C1 of a multi-plate type It is arranged at the serial. Moreover, an engine 1 and the 1st clutch C1 The 2nd one way clutch F2 which engages with it when transmitting torque from an engine 1 in between It is arranged. Therefore, in the sun gear 112 of an engine 1 to the 1st epicyclic gear device, it is the 2nd one way clutch F2. The 1st clutch C1 It minds and torque is transmitted. Furthermore between an engine 1 and the sun gear 113 of the 2nd epicyclic gear device 111, it is the 2nd clutch C2 of a multi-plate type. It is arranged.

[0139] The 1st brake B1 which fixes alternatively the ring wheel 114 of the 1st epicyclic gear device 110 and the carrier 117 of the 2nd epicyclic gear device 111 which are connected It is prepared.

Moreover, the carrier 116 of the 1st epicyclic gear device 110 is connected with the output shaft 10.

[0140] Moreover, between the follower pulleys 13 and casing 9, it is the 3rd one way clutch F3. 2nd brake B-2 of a multi-plate type It is arranged at the sequence. [ in / on the other hand / a change gear 11 ] This one way clutch F3 It is constituted so that it may be engaged, when torque is received in the direction which carries out \*\*\*\*\* go-astern transit when the follower pulley 13 tends to carry out inverse rotation. Furthermore, the 3rd clutch C3 which connects both alternatively between these follower pulley 13 and counter gear 15 It is prepared.

[0141] In addition, along with the medial-axis line of a driving pulley 12, pumping axes 118 penetrate and are arranged. One edge of these pumping axes 118 is connected so that it may really rotate on the shaft connected with the engine 1 or the engine 1, and the other-end section minds the chain device 119, and it is an oil pump Op. It is connected. In addition, a sign 120 shows a drive plate and 121 shows a damper device, respectively.

[0142] Various kinds of transit modes (operation mode) can be set up like each example mentioned above also in the hybrid driving gear shown in drawing 36 mentioned above. That is, at the starting mode which puts an engine 1 into operation in the condition that the car has stopped, it is the 2nd clutch C2. You make it engaged. The 2nd clutch C2 Since an engine 1 is connected with the sun gear 113 of the 2nd epicyclic gear device 111 and the motor generator 2 is always connected with this sun gear 113 by being engaged, a motor generator 2 and an engine 1 will be in a direct connection condition. Therefore, if a motor generator 2 is driven to a forward hand of cut, an engine 1 can be put into operation by rotating an engine 1, and supplying a fuel in the condition, and lighting if needed.

[0143] Moreover, the ETC mode which can amplify the output torque of an engine 1 with a motor generator 2 at the time of advance transit, and can be outputted to an output shaft 10 is the 1st clutch C1. And the 3rd clutch C3 You make it engaged and it sets up. That is, when the carrier 116 of the 1st epicyclic gear device 110 connected with the output shaft 10 and the ring wheel 115 of the 2nd epicyclic gear device 111 are fixed, it becomes the relation which the sun gear 112 of the 1st epicyclic gear device 110 and the sun gear 113 of the 2nd epicyclic gear device 111 rotate to an opposite direction mutually, and an engine 1 and a motor generator 2 will be connected with these rotation element mutually rotated to an opposite direction.

[0144] The collinear Fig. has shown this condition to drawing 37 . That is, if an engine 1 is operated in the for example most efficient condition and inverse rotation of the motor generator 2 is carried out at a predetermined rotational frequency in the condition, as a continuous line shows to drawing 37 , rotation of an output shaft 10 can stop and a stop condition can be maintained. If the torque of the forward hand of cut of a motor generator 2 is increased from this condition, that rotational frequency will increase (the rotational frequency of the direction of inverse rotation decreasing), and the output shaft 10 connected with the carrier 116 of the 1st epicyclic gear device 110 which is an output element, the ring wheel 115 of the 2nd epicyclic gear device 111, and these in connection with it will carry out forward rotation, as a broken line shows to drawing 37 . And the torque produced in the output shaft 10 becomes larger than the output torque of an engine 1. Therefore, a magnification operation of torque arises like a torque converter. In addition, transfer of the torque from an engine 1 to the 1st sun gear 112 is an one way clutch F2. Since it is carried out by minding, in a power-off condition, it is this one way clutch F1. It releases. Therefore, an engine 1 can be suspended in the state of power-off.

[0145] Since it is the mode which makes a motor generator 2 the so-called condition of having linked directly at an output shaft 10, the motor mode at the time of advance transit is each 1st thru/or 3rd clutch

C1, C2, and C3. You make it engaged. the 2nd clutch C2 you make it engaged -- the 2nd one way clutch F2 \*\*\*\* -- since the torque of a forward hand of cut will input from an engine 1 side -- this one way clutch F1 It is engaged. Moreover, this 2nd one way clutch F2 The 1st clutch C1 which has a serial relation By being engaged, the 1st one way clutch F2 is the 1st clutch C1. It minds and connects with the sun gear 112 of the 1st epicyclic gear device 110. Consequently, a motor generator 2 is connected with the sun gear 112 of the 1st epicyclic gear device 110. Moreover, since this motor generator 2 is always connected with the sun gear 113 of the 2nd epicyclic gear device 111, each sun gear 112,113 will be connected in one after all. Therefore, the 1st epicyclic gear device 110 and the whole 2nd epicyclic gear device 111 are unified, and the power of a motor generator 2 is transmitted to an output shaft 10 as it is, and can carry out advance transit with the power of a motor generator 2.

[0146] In addition, it is the 2nd one way clutch F2 in this case. The 1st clutch C1 An engine 1 is connected with the sun gear 112 of the 1st epicyclic gear device 110, and is made to rotate with the power of a motor generator 2 by being engaged. It will be in the condition of dragging the so-called engine 1. Therefore, it is desirable to reduce the resistance accompanying making an engine 1 race by the thing of making the throttle valve (not shown) of an engine 1 full open, or opening both an intake valve and an exhaust air bulb as much as possible. Moreover, since it continues making an engine 1 rotated during transit, starting of the engine 1 under transit becomes easy.

[0147] As mentioned above, they are each 1st thru/or 3rd clutch C1, C2, and C3. If you make it engaged, since an engine 1 and a motor generator 2 will be in the condition of having been directly linked to the output shaft 10, if it outputs not only from the motor generator 2 but from the engine 1, advance transit can be carried out with the power of an engine 1 and a motor generator 2. That is, it becomes engine motor mode.

[0148] When the mode at the time of go-astern transit is explained below, the engine mode which carries out go-astern transit with the power of an engine 1 is the 2nd clutch C2. The 3rd clutch C3 The 1st brake B1 You make it engaged. That is, while connecting an engine 1 with the sun gear 113 of the 2nd epicyclic gear device 111, the carrier 117 is fixed. Therefore, the output shaft 10 connected with a ring wheel 115 and this if forward rotation of the sun gear 113 is carried out with an engine 1 carries out inverse rotation, and the power is a change gear 11 and the 3rd clutch C3. It minds, and it is outputted and will be in a go-astern condition. This condition is shown in drawing 38 as a collinear Fig.

[0149] Moreover, since the motor generator 2 is always connected with the sun gear 113 of the 2nd epicyclic gear device 111 in this case, if it outputs not only from the engine 1 but from the motor generator 2, since the power of an engine 1 and a motor generator 2 will be transmitted to an output shaft 10, it becomes the engine motor mode in go-astern transit.

[0150] Furthermore, the 1st brake B1 If you make it engaged and the torque of a forward hand of cut is inputted into the sun gear 113 of the 2nd epicyclic gear device 111, since the output shaft 10 connected with a ring wheel 115 and this will carry out inverse rotation and will be in a go-astern run state The 2nd clutch C2 If it releases, an engine 1 is intercepted from the sun gear 113 of the 2nd epicyclic gear device 111 and a motor generator 2 is driven to a forward hand of cut in the condition, go-astern transit can be carried out with the power of a motor generator 2. That is, it becomes the motor mode at the time of go-astern transit.

[0151] As mentioned above, the 1st brake B1 If forward rotation of the sun gear 113 is carried out where the carrier 117 of the 2nd epicyclic gear device 111 is fixed, since the ring wheel 115 connected with the output shaft 10 will carry out inverse rotation, if forward rotation of the ring wheel 115 is carried out contrary to this, a sun gear 113 will carry out inverse rotation. Regenerative braking at the time of advance transit can be performed using this. For example, by the braking demand at the time of carrying out advance transit in the ETC mode mentioned above, it is the 1st clutch C1. It changes and is the 1st brake B1. If you make it engaged, as the collinear Fig. is shown in drawing 39, where the carrier 117 of the 2nd epicyclic gear device 111 is fixed, the ring wheel 115 will carry out forward rotation by the torque inputted from an output shaft 10, consequently a sun gear 113 will carry out inverse rotation. Since the torque which acts on this sun gear 113 is transmitted to a motor generator 2 and a motor generator 2 is made to carry out inverse rotation compulsorily, electromotive force arises with a motor



generator 2. That is, since the power inputted from an output shaft 10 is changed into electrical energy and consumed, the drag force in that case acts as damping force.

[0152] Moreover, a leech hold mode can be set up in the hybrid driving gear shown in above-mentioned drawing 36. A leech hold mode is 2nd brake B-2 which is the mode held so that a car may not retreat at the time of start on a climb way, and this mentioned above. And it is attained by this and the 3rd serial one way clutch. Namely, the 3rd one way clutch F3 Since it is engaged in case the follower pulley 13 tends to rotate in the go-astern transit direction, it is 2nd brake B-2. And the 3rd clutch C3 If it stops on a climb way in the condition that you made it engaged and a braking operation is canceled, the load which carries out retreat migration with the self-weight will act on a car. That is, since the torque to which inverse rotation of this is carried out acts on the follower pulley 13, it is the 3rd one way clutch F3. It is engaged and the rotation is prevented. That is, in case it departs on a climb way, even if it cancels braking actuation and performs start actuation, retreat migration of a car is prevented, and smooth start from a idle state can be performed.

[0153] Thus, even if it is the hybrid driving gear of a configuration of being shown in drawing 36, while being able to perform smoothly transit which needs the large driving force at the time of start etc. by amplifying and outputting an engine torque at the time of advance transit, go-astern transit can be carried out with the power of an engine 1. Moreover, even if it is the configuration shown in drawing 36, it is the 1st clutch C1. And the 2nd clutch C2 Since the output torque of an engine 1 is transmitted as it is, especially the transfer torque capacity does not need to be large, therefore they are these clutches C1 and C2. It can miniaturize and a hybrid driving gear can be formed into small lightweight as a whole.

[0154] Other examples which used 2 sets of epicyclic gear devices are explained below. Like the example shown in drawing 36 mentioned above, 2 sets of single pinion mold epicyclic gear devices are used for the example shown in drawing 40, and it changes the connection condition of the rotation element, and the connection condition of an engine 1 or friction engagement equipment with the configuration of drawing 36. That is, the carrier 116 of the 1st epicyclic gear device 110 is connected with the ring wheel 115 of the 2nd epicyclic gear device 111 in one, and the sun gear 112 of the 1st epicyclic gear device 110 is connected with the carrier 117 of the 2nd epicyclic gear device 111 in one.

[0155] Moreover, it is the 1st clutch C1 between the ring wheel 114 of the 1st epicyclic gear device 110, and an engine 1. It is arranged and is the 2nd clutch C2 between the sun gear 113 of the 2nd epicyclic gear device 111, and an engine 1. It is arranged. Furthermore, it is the 1st brake B1 so that rotation of the sun gear 112 of the 1st epicyclic gear device 110 may be fixed alternatively. It is arranged. Since other configurations are the same as the configuration shown in drawing 36, they give the same sign as drawing 36 to drawing 40, and omit the explanation.

[0156] When the transit mode (operation mode) which can be set up with this hybrid driving gear is explained, engine starting mode is the 1st clutch C1. 2nd brake B-2 You make it engaged and it sets up. The collinear Fig. of this condition is shown in drawing 41. When 2nd brake B-2 is made engaged, the inverse rotation of the follower pulley 13 10, i.e., an output shaft, is the 3rd one way clutch F3. It is prevented. Therefore, since the carrier 116 of an output shaft 10 and the 1st epicyclic gear device 110 of one is fixed when inverse rotation of the motor generator 2 is carried out and the torque of the direction of inverse rotation is given to the sun gear 112 of the 1st epicyclic gear device 110, a ring wheel 114 carries out forward rotation. Since the engine 1 is connected with this ring wheel 114, an engine 1 can be put into operation by making an engine 1 carry out forward rotation with the power of a motor generator 2, and supplying a fuel in that condition after all, and lighting if needed.

[0157] In that case, the carrier 116 of the 1st epicyclic gear device 110 used as a fixed element is said 3rd one way clutch F3. It is possible to be held so that inverse rotation may not be carried out, and to carry out forward rotation. Therefore, if an engine 1 is operated in the for example most efficient condition and the output torque of the forward hand of cut of a motor generator 2 is gradually increased in the condition after putting an engine 1 into operation, a carrier 116 and the output shaft 10 of this and one will begin to carry out forward rotation. Namely, the 3rd one way clutch F3 Engagement is canceled. And the driving torque in that case turns into torque which amplified the output torque of an



engine 1 with the motor generator 2. This is the 1st clutch C1 with the hybrid driving gear of a configuration of being the same as that of the magnification function of the torque by the torque converter, therefore being shown in drawing 40. And the 3rd clutch C3 The so-called ETC mode can be set up by making it engaged. In other words, this mode is the mode which connects an engine 1 and a motor generator 2 with two rotation elements used as the relation mutually rotated to an opposite direction, and is set as them, when an output shaft 10 and the rotation element of one are fixed.

[0158] Thus, when starting a car, it is 2nd brake B-2. And the 3rd one way clutch F3 Since it is engaged and retreat migration of a car is prevented, the leech hold facility mentioned above can be obtained.

[0159] Below, the motor mode at the time of advanced transit is explained. This motor mode is the mode links a motor generator 2 with an output shaft 10 directly, and it runs under the power of a motor generator 2, therefore is the 1st thru/or the 3rd clutch C1, C2, and C3. You make it engaged. The 1st and 2nd clutches C1 and C2 If you make it engaged, since the ring wheel 114 of the 1st epicyclic gear device 110 and the sun gear 113 of the 2nd epicyclic gear device 111 will be connected in one, each whole epicyclic gear device 110,111 is unified. Therefore, a motor generator 2 is directly linked with an output shaft 10, and the power of a motor generator 2 is outputted as it is. In that case, since an engine 1 is also directly linked with an output shaft 10 through the epicyclic gear device 110,111, an engine 1 is made raced. Thus, in order to prevent loss of the power for making an engine 1 race, it is desirable to establish the proper clutch device for separating from the epicyclic gear device 110,111 in which the engine 1 was unified. Moreover, if an engine 1 is made to race, operation of auxiliary machinery, such as starting of the engine 1 of a under [ transit ] and an air-conditioner, becomes easy.

[0160] In motor mode, since an engine 1 is also directly linked with an output shaft 10 as mentioned above, if not only the motor generator 2 but the engine 1 is driven, advance transit can be carried out with the power of an engine 1 and a motor generator 2. That is, it becomes engine motor mode.

[0161] Also in the configuration shown in above-mentioned drawing 40, go-astern transit can be carried out with the output of an engine 1. This engine mode is the 2nd clutch C2. The 3rd clutch C3 The 1st brake B1 You make it engaged and it sets up. This condition is shown in drawing 42 as a collinear Fig. The 1st brake B1 Where the sun gear 112 of the 1st epicyclic gear device 110 and the carrier 117 of the 2nd epicyclic gear device 111 are fixed, it is an engine 1 to the 2nd clutch C2. If it minds and the torque of a forward hand of cut is transmitted to the sun gear 113 of the 2nd epicyclic gear device 111, the output shaft 10 connected with the ring wheel 115 and this will carry out inverse rotation, and the power of an engine 1 will be outputted as power of the direction of inverse rotation. That is, go-astern transit is carried out.

[0162] It is the 1st brake B1 about the reaction force for go-astern transit in this mode. Although given, it is the 1st brake B1. Since the motor generator 2 is connected with the sun gear 112 of the 1st epicyclic gear device 110 connected, reaction force can be given with a motor generator 2. If reaction force by the motor generator 2 is gradually made small when it does in this way, the carrier 117 of the sun gear 112 of the 1st epicyclic gear device 110 and the 2nd epicyclic gear device 111 of this and one will begin to carry out forward rotation gradually, and the rotational frequency of a ring wheel 115 and the output shaft 10 of this and one will fall to this and coincidence. and -- just -- being alike -- rotation of an output shaft 10 stops. Moreover, if the reaction force (torque of the direction of inverse rotation) by the motor generator 2 is increased contrary to this, the rotational frequency of the direction of inverse rotation of an output shaft 10 will increase. That is, the driving torque for go-astern transit can be controlled by the output of a motor generator 2, and, moreover, the driving torque turns into torque which amplified the engine torque with the motor generator 2. Like the ETC mode at the time of advance transit, this is the magnification function of torque and can set up ETC mode with the configuration shown in drawing 40 also at the time of go-astern transit.

[0163] In addition, when the proper clutch means which separates an engine 1 from the unified epicyclic gear device 110,111 is established in the motor mode which linked the motor generator 2 with the output shaft 10 directly as mentioned above although motor mode for go-astern transit cannot be set up with a configuration of being shown in drawing 40 since an engine 1 is also directly linked with an output shaft 10 as mentioned above, go-astern transit can be carried out only with the power of a motor generator 2.

[0164] Thus, also in the hybrid driving gear of a configuration of being shown in drawing 40, since go-astern transit can be carried out with the power of an engine 1 while being able to obtain the function as a torque converter which amplifies and outputs an engine torque, even if it is the case where the charge capacity of a dc-battery (not shown) is falling, sufficient driving force for go-astern transit can be obtained. moreover, clutch C1 which adjoins the epicyclic gear device 110,111 and is arranged C2 \*\*\*\* -- since it is transmitted while the output torque of an engine 1 has not been amplified -- these clutches C1 and C2 the transfer torque capacity demanded is small, therefore attains small lightweight-ization of equipment -- things can be carried out. Since a motor generator 2 can be adjoined and the epicyclic gear device 110,111 can be arranged as furthermore shown in drawing 40, by considering as such a configuration, it can become possible to make a part of epicyclic gear device 110,111 enter into the inner circumference side of Rota of a motor generator 2, consequently axial length as the whole equipment can be shortened, and small lightweight-ization can be attained.

[0165] When the relation between this invention and each example mentioned above is explained here, the example shown in drawing 1 and drawing 6 thru/or drawing 8 is an example of invention of claim 1 and claim 2, and the example shown in drawing 9 is an example of invention of claim 1 and claim 3. The example furthermore shown in drawing 15 is an example of invention of claim 5 and claim 6, and the example shown in drawing 20 is an example of invention of claim 1 and claim 4. The examples shown in drawing 26 are claim 7 thru/or an example of invention of nine, and the example shown in drawing 31 is an example of invention of claim 7 and the claim warehouse 10. The example shown in drawing 36 is an example of invention of claim 11, claim 12, and claim 14. And the example shown in drawing 40 is an example of invention of claim 11, claim 13, and claim 14.

[0166] In addition, by the above-mentioned example, although the belt-type nonstep variable speed gear was shown as a change gear, in this invention, it may change to this, and a toroidal-type nonstep variable speed gear may be used, and the change gear of an owner stage type may be used. Furthermore, the thing of proper configurations, such as a belt type and an engagement type, can be used for a clutch means or a brake means in addition to the friction engagement equipment of a wet multi-plate type.

[0167]

[Effect of the Invention] Since go-astern transit can be carried out with the power which an internal combustion engine outputs according to the hybrid driving gear by this invention as explained above, even if it is the case where the charge of the dc-battery which is the source of power of a motor is falling, go-astern transit can be carried out with the large driving force by the internal combustion engine. Moreover, since it amplifies under the power under which a motor outputs the torque which an internal combustion engine outputs in the case of advance transit and can output to an output member, smooth transit can be performed also in case the large torque at the time of start etc. is required. Since the rotational frequency and output torque of an output member are controllable by the condition of furthermore operating the internal combustion engine in the fixed condition with the output of a motor, the control at the time of start becomes easy. And the starter motor which is made to rotate an internal combustion engine and puts an internal combustion engine into operation with a motor again and which was carried in the car of the general former since things were carried out can be abolished, and small lightweight-ization can be attained.

[0168] And especially according to invention of claim 5, also in case go-astern transit is carried out under an internal combustion engine's power, the torque which an internal combustion engine outputs can be amplified with the output of a motor, and the start control at the time of carrying out go-astern transit becomes easy.

[0169] Moreover, according to invention of claim 10, the change gear ratio for carrying out go-astern transit can be enlarged, and the driving force adapted to a demand can be obtained.

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[Translation done.]

**\* NOTICES \***

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**TECHNICAL FIELD**

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[Field of the Invention] This invention relates to the hybrid driving gear equipped with the motor which operates with power, such as internal combustion engines, such as a gasoline engine and a diesel power plant, a motor, and a motor generator, and outputs power for cars.

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**PRIOR ART**

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[Description of the Prior Art] An internal combustion engine produces exhaust gas unescapable as everyone knows. The cleanliness of exhaust gas tends to fall at the time of heavy load operation to which the component and amount of the exhaust gas increased throttle opening as a general inclination depending on an internal combustion engine's operational status, and fuel consumption also tends to fall. On the other hand, recently, the hybrid driving gear is developed so that the demand of the cleanliness to the exhaust gas of the car carrying an internal combustion engine may become high and may meet such a request.

[0003] A hybrid driving gear is a driving gear equipped with the internal combustion engine and the motor as a source of power, and fundamentally, it operates in the most efficient condition, and the internal combustion engine consists of other run states so that a motor may be used as a source of power auxiliary. Therefore, although the change gear [ as / in the conventional car which made only the internal combustion engine the source of power ] was not used since the hybrid driving gear was equipped with the motor which can control torque by the current, with the hybrid driving gear which uses an internal combustion engine also as a source of power for transit only as a source of power for a generation of electrical energy, a change gear is increasingly carried like the so-called parallel hybrid format. Furthermore, an internal combustion engine's torque and the torque of a motor are inputted into single change gear styles, such as an epicyclic gear device, and the equipment constituted so that an internal combustion engine's output torque might be amplified and outputted is also developed.

[0004] The example is indicated by JP,9-37411,A. While the equipment indicated by drawing 11 of this official report is equipped with a double pinion mold epicyclic gear device and an output shaft is connected with that ring wheel, the input clutch which a motor generator is connected with a sun gear, and connects a carrier and an engine alternatively is prepared, and the unification clutch which connects the brake which fixes a carrier alternatively further, and a carrier and a sun gear, and unifies the whole epicyclic gear device is prepared. And the output shaft can be connected with a nonstep variable speed gear.

[0005] Therefore, in the hybrid driving gear indicated by drawing 11 of the above-mentioned official report, if power is inputted into a sun gear from a motor generator in the condition of having inputted power into the carrier from the engine, larger torque than an engine torque will be outputted to the ring wheel which is an output member, and inverse rotation of the motor generator will be carried out and power will be absorbed, it can generate electricity. Moreover, driving force can be continuously changed according to the change gear ratio in a nonstep variable speed gear. Using the torque-amplification function and the modification function of the continuous change gear ratio of a nonstep variable speed gear in such an epicyclic gear device, an internal combustion engine can be operated so that fuel consumption may become the best.

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**EFFECT OF THE INVENTION**

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[Effect of the Invention] Since go-astern transit can be carried out with the power which an internal combustion engine outputs according to the hybrid driving gear by this invention as explained above, even if it is the case where the charge of the dc-battery which is the source of power of a motor is falling, go-astern transit can be carried out with the large driving force by the internal combustion engine. Moreover, since it amplifies under the power under which a motor outputs the torque which an internal combustion engine outputs in the case of advance transit and can output to an output member, smooth transit can be performed also in case the large torque at the time of start etc. is required. Since the rotational frequency and output torque of an output member are controllable by the condition of furthermore operating the internal combustion engine in the fixed condition with the output of a motor, the control at the time of start becomes easy. And the starter motor which is made to rotate an internal combustion engine and puts an internal combustion engine into operation with a motor again and which was carried in the car of the general former since things were carried out can be abolished, and small lightweight-ization can be attained.

[0168] And especially according to invention of claim 5, also in case go-astern transit is carried out under an internal combustion engine's power, the torque which an internal combustion engine outputs can be amplified with the output of a motor, and the start control at the time of carrying out go-astern transit becomes easy.

[0169] Moreover, according to invention of claim 10, the change gear ratio for carrying out go-astern transit can be enlarged, and the driving force adapted to a demand can be obtained.

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] If it has the motor as a source of power as mentioned above, since the output torque of a motor is controllable by the current, a change gear is fundamentally unnecessary and said epicyclic gear device and nonstep variable speed gear are used also in the conventional hybrid driving gear mentioned above as a control means for operating so that an internal combustion engine's fuel consumption may become best. Therefore, when running with an internal combustion engine's output, an opposite direction cannot be made to rotate the ring wheel which is an output element with the configuration of the above-mentioned epicyclic gear device to the carrier which is an input element. Therefore, in carrying out go-astern transit with the above-mentioned conventional hybrid equipment, while making an internal combustion engine into an idling condition, the opposite direction is made to rotate the ring wheel which is an output element with an internal combustion engine by fixing a carrier in a brake and operating a motor generator as a motor in the condition.

[0007] That is, it consists of above-mentioned conventional hybrid driving gears so that a motor may perform go-astern transit. Therefore, when there were few charges (SOC) of a capacitor (dc-battery), sufficient torque required of go-astern transit may be unable to be outputted. It must stop having to wait for go-astern transit for that purpose, although what is necessary is to charge by starting an internal combustion engine and just to increase the charge of a dc-battery, in order to cancel such un-arranging until charge is completed. With the parallel hybrid equipment of a format with which especially the motor served as the generator, since the transit and the generation of electrical energy by the motor could not be performed to coincidence, when the charge in a capacitor fell, there was un-arranging [ to which go-astern transit becomes difficult immediately ].

[0008] This invention makes the above-mentioned situation a background, is made, and even if it is a case with few charges of a capacitor, it aims at offering the hybrid driving gear which can secure the torque for go-astern transit in need 10 minutes.

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**OPERATION**

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[Means for Solving the Problem and its Function] In order to solve the above-mentioned technical problem, invention indicated to claim 1 A sun gear and the ring wheel arranged on a concentric circle to this sun gear, The epicyclic gear device which uses as a rotation element the carrier which held two or more pinion gears arranged between these sun gears and a ring wheel free [ rotation and revolution ] is minded. In the hybrid driving gear which outputs power to an output member from an internal combustion engine and a motor While a brake means to fix alternatively the rotation element used as the relation which is any rotation 1 of said three rotation elements, and other two rotation elements rotate to an opposite direction mutually by being fixed is established Said internal combustion engine is connected with one rotation element of two rotation elements besides the above always or alternatively. And a 1st clutch means to connect alternatively with said output member the rotation element with which said motor was connected with the rotation element of another side always or alternatively, and said motor was connected further, It is characterized by establishing a 2nd clutch means to connect said output member with the rotation element fixed by said brake alternatively.

[0010] Therefore, while fixing the rotation element connected with this brake means by the brake means according to invention of claim 1 If connection to the rotation element and output member which connect with an output member the rotation element with which the motor was connected, and are further fixed with a brake means by making the 2nd clutch means into non-operating state by the 1st clutch means is canceled The rotation element with which the rotation element with which the internal combustion engine was connected, and the output member are connected serves as relation mutually rotated to an opposite direction. Therefore, if an internal combustion engine is driven, an output member can carry out inverse rotation and can carry out go-astern transit. Moreover, cancel immobilization of a rotation element by making a brake means into non-operating state, and connection to the rotation element with which the motor was connected with the output member by making the 1st clutch means into non-operating state is canceled. If the rotation element which the 2nd clutch means is furthermore operated and is connected with the brake means, and an output member are connected, since the power of a motor can be inputted into the rotation element which turns into a reaction force element to the rotation element with which the internal combustion engine is connected It can be made to stop by being able to control the torque of an output member by torque of a motor, and controlling the output of a motor for rotation of an output member, with an internal combustion engine operated.

[0011] Invention of claim 2 is set in the configuration of claim 1. Moreover, said epicyclic gear device It consists of a double pinion mold epicyclic gear device in which it has the 2nd pinion gear which geared to the 1st pinion gear which geared to said sun gear, this 1st pinion gear, and said ring wheel. Said motor is connected with the carrier holding these pinion gears. And an internal combustion engine is connected with said sun gear, and said brake means is further arranged between said ring wheels and casing. While said output member is connected with said carrier through the 1st clutch means, it is characterized by being constituted so that it may connect with said ring wheel through the 2nd clutch means.

[0012] therefore, if a ring wheel is fixed with a brake means according to invention of claim 2, a sun gear and a carrier will rotate to an opposite direction mutually -- relation -- by \*\*, if an internal



combustion engine is driven where a carrier is connected with an output member with the 1st clutch means, an internal combustion engine can do inverse rotation to an opposite direction, therefore an output member can perform go-astern transit. Moreover, since the power of a motor will be inputted into the carrier which serves as a reaction force element to a sun gear if a ring wheel and an output member are connected with the 2nd clutch means while canceling immobilization of the ring wheel by the brake means, it can be made to stop by being able to control the torque of an output member by torque of a motor, and controlling the output of a motor for rotation of an output member, with an internal combustion engine operated.

[0013] Invention of claim 3 is set in the configuration of claim 1. Said epicyclic gear device It consists of a double pinion mold epicyclic gear device in which it has the 2nd pinion gear which geared to the 1st pinion gear which geared to said sun gear, this 1st pinion gear, and said ring wheel. Said internal combustion engine is connected with the carrier holding these pinion gears. And a motor is connected with said sun gear and said brake means is further arranged between said ring wheels and casing. While said output member is connected with said sun gear through the 1st clutch means, it is characterized by being constituted so that it may connect with said ring wheel through the 2nd clutch means.

[0014] Therefore, while fixing a ring wheel with a brake means according to invention of claim 3 If it considers as the condition of having connected the sun gear and the output member with the 1st clutch means, and having canceled connection to the ring wheel and output member by the 2nd clutch means Since a sun gear and a carrier serve as relation mutually rotated to an opposite direction like invention of claim 2 If an internal combustion engine's power is inputted into a carrier, in order that a sun gear may carry out inverse rotation to a carrier to an opposite direction, i.e., an internal combustion engine, consequently the output member of one may carry out inverse rotation to a sun gear, an internal combustion engine's power can perform go-astern transit. Moreover, if connection to the sun gear and output member by the 1st clutch means is canceled where immobilization of the ring wheel by the brake means is canceled, and a ring wheel and an output member are connected with the 2nd clutch means Since the power of a motor is inputted into the sun gear which serves as a reaction force element to a carrier, it can be made to stop by being able to control the torque of an output member by torque of a motor, and controlling the output of a motor for rotation of an output member, with an internal combustion engine operated.

[0015] Invention of claim 4 is set in the configuration of claim 1. Said epicyclic gear device It consists of a single pinion mold epicyclic gear device in which it has two or more pinion gears which geared to said sun gear and ring wheel. Said brake means is arranged between the carriers and casing holding these pinion gears. And a motor is connected with said sun gear and said internal combustion engine is further connected with said ring wheel. While said output member is connected with said sun gear through the 1st clutch means, it is characterized by being constituted so that it may connect with said carrier through the 2nd clutch means.

[0016] Therefore, while fixing a carrier with a brake means according to invention of claim 4 If it considers as the condition of having connected the sun gear and the output member with the 1st clutch means, and having canceled connection to the carrier and output member by the 2nd clutch means If it becomes the relation which the sun gear connected with the ring wheel with which the internal combustion engine is connected when a carrier is a fixed element, and the output member rotates to an opposite direction mutually, therefore an internal combustion engine is driven The output member connected with a sun gear and this will carry out inverse rotation (namely, an internal combustion engine's hand of cut rotation of an opposite direction), consequently go-astern transit can be carried out with an internal combustion engine's power. Moreover, if an output member and a carrier are connected with the 2nd clutch means while canceling connection to the output member and sun gear by the 1st clutch means, where immobilization of the carrier by the brake means is canceled Since the power from a motor can be inputted into the sun gear which serves as a reaction force element to the ring wheel with which the internal combustion engine is connected It can be made to stop by being able to control by torque of a motor the torque of the output member connected with the carrier, and controlling the output of a motor for rotation of an output member, with an internal combustion engine operated.

[0017] The ring wheel by which invention of claim 5 has been arranged on a concentric circle to a sun gear and this sun gear, The epicyclic gear device which uses as a rotation element the carrier which held two or more pinion gears arranged between these sun gears and a ring wheel free [ rotation and revolution ] is minded. In the hybrid driving gear which outputs power to an output member from an internal combustion engine and a motor While said motor is connected with the rotation element used as the relation which is any rotation 1 of said three rotation elements, and other two rotation elements rotate to an opposite direction mutually by being fixed through the 1st input clutch means Said motor is connected with one rotation element of two rotation elements besides the above through the 2nd input clutch means. And a 1st output clutch means to connect alternatively with said output member the rotation element with which said internal combustion engine was connected with the rotation element of another side always or alternatively, and said motor was further connected by said 2nd input clutch means, It is characterized by establishing a 2nd output clutch means to connect alternatively with said output member the rotation element connected with said motor by said 1st input clutch means.

[0018] Therefore, according to invention of claim 5, clutch means \*\*\*\* aforementioned each of these rotation members are connected by making the 1st input clutch means and the 1st output clutch means into operating state. And if the connection condition by these clutch means is canceled by making the 2nd input clutch means and the 2nd output clutch means into non-operating state It is transmitted to the rotation element with which the power which a motor outputs was connected by the 1st input clutch means, and an output member is connected with other rotation elements to this. In this condition, if the rotation element which the rotation element with which the rotation element with which the internal combustion engine is connected, and the output member are connected turns into the so-called reaction force element mutually, therefore is connected by the 1st input clutch means with the motor is fixed, an internal combustion engine's power is reversed, and it is transmitted to an output member, consequently go-astern transit can be carried out with an internal combustion engine's power. In that case, if the power which a motor outputs is controlled, the rotational frequency or torque of a rotation element with which the output member is connected can change, therefore the driving force at the time of go-astern transit can be controlled by the motor. Moreover, rotation of the output member can also be stopped by controlling the output of a motor. On the other hand, operate the 2nd input clutch means and the 2nd output clutch means, and each rotation member by these clutch means is connected. And if the connection actuation by these clutch means is canceled by making the 2nd input clutch means and the 1st output clutch means into non-operating state, while the rotation element with which the output member is connected by the 2nd output clutch means will turn into an output element The rotation element by which the motor is connected with the rotation element with which the internal combustion engine is connected with the 2nd input clutch means turns into a reaction force element mutually. Therefore, if the power which a motor outputs where an internal combustion engine is operated is changed, since the torque of an output member will change according to the torque which a motor outputs, it can be made to stop by being able to control the torque of an output member by torque of a motor, and controlling the output of a motor for rotation of an output member, with an internal combustion engine operated.

[0019] Invention of claim 6 is characterized by arranging the one way clutch between said rotation elements and casing which are connected with said 1st input clutch means and said 2nd output clutch means in the configuration of claim 5.

[0020] therefore, according to invention of claim 6, where rotation of said rotation element is stopped with an one way clutch Since the rotation element with which the motor is connected with the rotation element with which the internal combustion engine is connected turns into a reaction force element mutually While the rotation element connected with this motor by the 2nd input clutch means by carrying out inverse rotation of the motor carries out inverse rotation, in order that the rotation element with which the internal combustion engine is connected may carry out forward rotation, the output torque of a motor is reversed and it is transmitted to an internal combustion engine. That is, since an internal combustion engine can be rotated with a motor, an internal combustion engine can be put into operation by the thing of supplying a fuel to an internal combustion engine in this condition.

[0021] In the hybrid driving gear which invention of claim 7 compounds individually the power which an internal combustion engine outputs, and the power which a motor outputs, and is transmitted to an output member The 1st sun gear and the ring wheel arranged on a concentric circle to this 1st sun gear, The carrier which holds the 2nd pinion gear which geared to the 1st pinion gear and this 1st pinion gear which geared to the 1st sun gear, and said ring wheel free [ rotation and revolution ], The RABINIYO mold epicyclic gear device in which it has the 2nd sun gear which got into gear to the 2nd pinion gear, A 1st clutch means to connect said internal combustion engine with said 1st sun gear alternatively, While having a 2nd clutch means to connect said internal combustion engine with said 2nd sun gear alternatively, and a brake means to fix said carrier alternatively and connecting said motor with said 2nd sun gear It is characterized by connecting said output member with said ring wheel.

[0022] Therefore, if according to invention of claim 7 a carrier is fixed with a brake means, and connection by the 1st clutch means is canceled and an internal combustion engine is further connected with the 2nd sun gear with the 2nd clutch means Since the 2nd sun gear and ring wheel become the relation of the sun gear and ring wheel in a single pinion mold epicyclic gear device, the output member connected with a ring wheel and this carries out inverse rotation by carrying out forward rotation of the 2nd sun gear with an internal combustion engine. That is, an internal combustion engine's power can perform go-astern transit. Moreover, if connection of each rotation member is canceled by making the 2nd clutch means and a brake means into non-operating state while connecting an internal combustion engine with the 1st sun gear with the 1st clutch means, it will be in the condition that the internal combustion engine and the motor were connected with the 1st sun gear and the 2nd sun gear which serve as a reaction force element mutually. Therefore, it can be made to stop by being able to control the torque of an output member by torque of a motor, and controlling the output of a motor for rotation of an output member, with an internal combustion engine operated.

[0023] In the hybrid driving gear which invention of claim 8 compounds individually the power which an internal combustion engine outputs, and the power which a motor outputs, and is transmitted to an output member The 1st sun gear and the ring wheel arranged on a concentric circle to this 1st sun gear, The carrier which holds the 2nd pinion gear which geared to the 1st pinion gear and this 1st pinion gear which geared to the 1st sun gear, and said ring wheel free [ rotation and revolution ], The RABINIYO mold epicyclic gear device in which it has the 2nd sun gear which got into gear to the 2nd pinion gear, A 1st clutch means to connect said internal combustion engine with said 1st sun gear alternatively, While having a 2nd clutch means to connect said motor with said carrier alternatively, and a brake means to fix said ring wheel alternatively and connecting said motor with said 2nd sun gear, it is characterized by connecting said output member with said carrier.

[0024] Therefore, according to invention of claim 8, a carrier carries out inverse rotation to the 1st sun gear by connecting an internal combustion engine with the 1st sun gear with the 1st clutch means, and fixing a ring wheel and canceling connection to a carrier and a motor by making the 2nd clutch means into non-operating state further with a brake means. Therefore, by driving an internal combustion engine and carrying out forward rotation of the 1st sun gear, the output member connected with a carrier and this can carry out inverse rotation, consequently go-astern transit can be carried out with an internal combustion engine's power. Moreover, if only the 1st clutch means is operated and an internal combustion engine is connected with the 1st sun gear, since it will be in the condition that the internal combustion engine and the motor were connected with each sun gear which serves as a reaction force element mutually, it can be made to stop by being able to control the torque of an output member by torque of a motor, and controlling the output of a motor for rotation of an output member, with an internal combustion engine operated.

[0025] Invention of claim 9 is characterized by establishing further the fixed means which stops alternatively rotation of the member connected with said output member or the output member at one in claim 7 or the configuration of 8.

[0026] Therefore, according to invention of claim 9, the 1st sun gear which serves as a reaction force element to the 2nd sun gear with which the motor was connected when operating the motor in the state of [ the ] the stop rotates rotation of the member of one to the 2nd sun gear in an opposite direction to an

output member or this with a fixed means. Therefore, the internal combustion engine is connected with the 1st sun gear with the 1st clutch means, and if inverse rotation of the motor is carried out, the internal combustion engine connected with the 1st sun gear and this will do forward rotation. If a fuel is supplied to an internal combustion engine and it lights in the condition if needed, an internal combustion engine can be put into operation.

[0027] Invention of claim 10 is characterized by the number of teeth of the part which has geared to the number of teeth and said 2nd sun gear of the part which has geared to said 1st pinion gear of said 2nd pinion gear being different in claim 7 or the configuration of 8.

[0028] Therefore, according to invention of claim 10, driving force in the case of running under the power of a motor can be enlarged by making [ many ] the number of teeth of the part with which it was different from the configuration the gear ratio at the time of transmitting to an output member indicated the power of a motor to be to claim 7 or 8, for example, the 2nd sun gear has geared.

[0029] In the hybrid driving gear which invention of claim 11 compounds individually the power which an internal combustion engine outputs, and the power which a motor outputs, and is transmitted to an output member A sun gear and the ring wheel arranged on a concentric circle to this sun gear, The 1st epicyclic gear device and the 2nd epicyclic gear device which carry out the rotation element of the carrier which held the pinion gear arranged between these sun gears and a ring wheel free [ rotation and revolution ], While a brake means to fix alternatively the rotation element used as the relation which is any one rotation element in the 2nd epicyclic gear device, and other two rotation elements rotate to an opposite direction mutually by being fixed is established A 2nd clutch means to connect said internal combustion engine with the rotation element of either of the two rotation elements besides the above alternatively is established. And the rotation element used as the relation which other two rotation elements rotate to the method of opposite mutually by connecting the rotation element of another side with said output member, being any one rotation element in said 1st epicyclic gear device, and being fixed Connect with said output member and said internal combustion engine is connected with the rotation element of either of the two rotation elements besides the above in the 1st epicyclic gear device of a parenthesis through the 1st clutch means. It is characterized by being constituted so that the power of said motor may furthermore be transmitted to the rotation element of another side of the two rotation elements besides the above in said 1st epicyclic gear device.

[0030] Therefore, according to invention of claim 11, other two rotation elements will be in the condition of rotating to an opposite direction mutually, by fixing the predetermined rotation element in the 2nd epicyclic gear device with a brake means. And since an internal combustion engine is connected with one side of the two rotation elements besides these and the output member is connected with another side by operating the 2nd clutch means, an output member rotates to an opposite direction with an internal combustion engine by driving an internal combustion engine. Therefore, go-astern transit can be carried out with an internal combustion engine's power. Moreover, where it connected the internal combustion engine with the predetermined rotation element of the 1st epicyclic gear device with the 1st clutch means and connection of each rotation element is canceled by making the 2nd clutch means and a brake means into non-operating state When a motor is reached and an internal combustion engine is driven, by the 2nd epicyclic gear device Since torque is inputted into other rotation elements from an internal combustion engine in the condition that the load from an output member is applied to the predetermined rotation element, torque arises to the rotation element of further others, and this is transmitted to either of two rotation elements besides the above in the 1st epicyclic gear device. Moreover, by the 1st epicyclic gear device, since the torque which an internal combustion engine outputs to the rotation element of another side starts and the torque according to the output of a motor is acting on the rotation element of said another side, an internal combustion engine's power and the power of a motor will act on two rotation elements which turn into a reaction force element mutually on both sides of the rotation element which is an output element. Consequently, it can be made to stop by being able to control the torque of an output member by torque of a motor, and controlling the output of a motor for rotation of an output member, with an internal combustion engine operated.

[0031] Invention of claim 12 is set in the configuration of claim 11. Said 1st epicyclic gear device and

the 2nd epicyclic gear device It is constituted by the single pinion mold epicyclic gear device in which two or more pinion gears which geared to the sun gear and the ring wheel were held free [ rotation and revolution ] with said carrier. While being arranged between the carrier of the 2nd epicyclic gear device, and casing, said brake means This carrier and the ring wheel of said 1st epicyclic gear device are connected. Said 2nd clutch means Are arranged so that the sun gear and internal combustion engine of said 2nd epicyclic gear device may be connected, and said motor is connected with the sun gear for \*\*. And the ring wheel of the 2nd epicyclic gear device is connected with the carrier of the 1st epicyclic gear device. It is characterized by connecting the carrier of the 1st epicyclic gear device with the ring wheel and output member of the 2nd epicyclic gear device furthermore, and connecting the sun gear of the 1st epicyclic gear device of a parenthesis with said internal combustion engine through said 1st clutch means.

[0032] Therefore, according to invention of claim 12, a sun gear and a ring wheel serve as relation mutually rotated to an opposite direction by fixing the carrier in the 2nd epicyclic gear device with a brake means. And since an internal combustion engine is connected with the sun gear of the 2nd epicyclic gear device and the output member is connected with the ring wheel by operating the 2nd clutch means, an output member rotates to an opposite direction with an internal combustion engine by driving an internal combustion engine. Therefore, go-astern transit can be carried out with an internal combustion engine's power. Moreover, where it connected the internal combustion engine with the sun gear of the 1st epicyclic gear device with the 1st clutch means and connection of each rotation member is canceled by making the 2nd clutch means and a brake means into non-operating state If a motor and an internal combustion engine are driven, since torque will be inputted into a sun gear in the condition that the load from an output member is applied to the ring wheel, in the 2nd epicyclic gear device, torque arises in a carrier and this is transmitted to the ring wheel of the 1st epicyclic gear device. Moreover, by the 1st epicyclic gear device, since the torque which an internal combustion engine outputs to a sun gear starts and the torque according to the output of a motor is acting on a ring wheel, an internal combustion engine's power and the power of a motor will act on the sun gear and ring wheel which serve as a reaction force element mutually on both sides of the carrier which is an output element. Consequently, it can be made to stop by being able to control the torque of an output member by torque of a motor, and controlling the output of a motor for rotation of an output member, with an internal combustion engine operated.

[0033] Invention of claim 13 is set in the configuration of claim 11. Said 1st epicyclic gear device and the 2nd epicyclic gear device It is constituted by the single pinion mold epicyclic gear device in which two or more pinion gears which geared to the sun gear and the ring wheel were held free [ rotation and revolution ] with said carrier. Said brake means is arranged so that these carriers and a sun gear may be fixed alternatively, while the carrier of the 2nd epicyclic gear device is connected with the sun gear of said 1st epicyclic gear device. Said 2nd clutch means is arranged so that the sun gear and internal combustion engine of said 2nd epicyclic gear device may be connected. And it is characterized by connecting this carrier with said output member, while the ring wheel of the 2nd epicyclic gear device is connected with the carrier of the 1st epicyclic gear device, and connecting the ring wheel of the 1st epicyclic gear device of a parenthesis with said internal combustion engine through said 1st clutch means.

[0034] Therefore, according to invention of claim 13, a sun gear and a ring wheel will be in the condition of rotating to an opposite direction mutually, by fixing the carrier in the 2nd epicyclic gear device with a brake means. And since an internal combustion engine is connected with the sun gear of the 2nd epicyclic gear device and the output member is connected with the ring wheel by operating the 2nd clutch means, an output member rotates to an opposite direction with an internal combustion engine by driving an internal combustion engine. Therefore, go-astern transit can be carried out with an internal combustion engine's power. Moreover, where it connected the internal combustion engine with the ring wheel of the 1st epicyclic gear device with the 1st clutch means and connection of each rotation member is canceled by making the 2nd clutch means and a brake means into non-operating state If a motor is reached and an internal combustion engine is driven, since torque will be inputted into a sun gear in the

condition that the load from an output member is applied to the ring wheel, in the 2nd epicyclic gear device, torque arises in a carrier and this is transmitted to the sun gear of the 1st epicyclic gear device. Moreover, by the 1st epicyclic gear device, since the torque which an internal combustion engine outputs to a ring wheel starts and the torque according to the output of a motor is acting on a sun gear, an internal combustion engine's power and the power of a motor will act on the ring wheel and sun gear which serve as a reaction force element mutually on both sides of the carrier which is an output element. Consequently, it can be made to stop by being able to control the torque of an output member by torque of a motor, and controlling the output of a motor for rotation of an output member, with an internal combustion engine operated.

[0035] And invention of claim 14 is characterized by establishing further the fixed means which stops alternatively rotation of the member currently united with said output member or the output member in the configuration of claim 11 or either of 13.

[0036] Therefore, since the rotation element which connected the internal combustion engine with the rotation element which connected the motor by stopping rotation of an output member or the rotation element of this and one with a fixed means will be in the condition rotate to this direction or an opposite direction according to invention of claim 14, if the torque of a proper direction is inputted into the rotation element connected with this from the motor, an internal combustion engine will be rotated by the forward hand of cut. Therefore, an internal combustion engine can be put into operation by supplying a fuel to an internal combustion engine in the condition, and lighting if needed.

[0037]

[Embodiment of the Invention] Below, this invention is explained more concretely. Drawing 1 is the mimetic diagram showing an example of the hybrid driving gear concerning this invention, and it is constituted so that it may compound and an internal combustion engine 1 and the power of a motor 2 may be outputted individually. The internal combustion engine 1 is a power plant which burns fuels, such as a gasoline engine and a diesel power plant, and outputs power. The following explanation describes an internal combustion engine an engine (Eng.) 1.

[0038] Moreover, a motor 2 is a power plant which rotates by supplying a current in short and outputs power, the motor of various kinds of formats, such as a synchronous type, can be used for it, and the motor further equipped with the generation-of-electrical-energy function can be used for it. The following explanation shows as an example what was equipped with the generation-of-electrical-energy function as a motor, and describes a motor a motor generator (M/G) 2.

[0039] The device which made the subject the double pinion mold epicyclic gear device 3 as a device which compounds and outputs individually the power of these engines 1 and a motor generator 2 is established. This epicyclic gear device 3 is the thing of a well-known configuration of using as a rotation element the carrier 8 which held the 2nd pinion gear 7 which geared to the 1st pinion gear 6 which gears to a sun gear 4, and this 1st pinion gear 6 and ring wheel 5 free [ rotation and revolution ], and performing a differential operation among these three rotation elements. [ the sun gear 4 which is an external-tooth gearing, this sun gear 4 and the ring wheel 5 which is the internal gear arranged on a concentric circle, and ]

[0040] The output shaft (for example, crankshaft) of an engine 1 is connected with the sun gear 4 among these rotation elements. Since it arises when a reciprocating engine is used as an engine 1, the fluctuation, i.e., the vibration, of torque by intermittent combustion of a fuel, in order to absorb or ease the vibration, a damper style (not shown) may be made to intervene between an engine 1 and a sun gear 4. Moreover, Rota 2r of a motor generator 2 is connected with the carrier 8.

[0041] Furthermore, it is a brake B1 between a ring wheel 5 and casing 9. It is prepared. This brake B1 It is for fixing a ring wheel 5 alternatively, and is casing 9. The equipment of friction engagement types, such as a multiple disc brake prepared in between and a band brake, can be used. Moreover, this brake B1 The thing of a format which operates electrically in addition to the thing of a format which operates with oil pressure can also be used.

[0042] The output shaft 10 which is an output member is arranged on the same axis as an engine 1. Two clutches are prepared as a means for transmitting power alternatively to this output shaft 10. Namely, the



1st clutch C1 which connects a carrier 8 and an output shaft 10 alternatively The 2nd clutch C2 which connects a ring wheel 5 and an output shaft 10 alternatively It is prepared. These clutches C1 and C2 Although the thing of the multi-plate type engaged and released with oil pressure is the most common, what could gear in addition to this, and could use the thing of various kinds of formats, such as a clutch of a formula, and was equipped with the means of an electric type as a means for its engagement and release can also be used.

[0043] Said output shaft 10 is connected with the change gear 11. This change gear 11 is for changing a change gear ratio and fluctuating driving torque, and various kinds of change gears, such as a change gear of the owner stage type constituted considering the epicyclic gear device as a subject, and an owner stage type change gear of the type which changes the connection relation of a rotation member according to a synchronous change-over device (synchronizer) etc., a belt-type nonstep variable speed gear, a toroidal-type nonstep variable speed gear, can be used for it. The belt-type nonstep variable speed gear 11 is typically shown in drawing 1 .

[0044] This nonstep variable speed gear 11 arranges in parallel the driving pulley 12 and the follower pulley 13 which can change a flute width, it is the thing of a well-known configuration, the belt (not shown) to these pulleys 12 and 13 rolls it, and it changes a credit radius by changing the flute width of each pulleys 12 and 13, and it is constituted so that a change gear ratio may be changed continuously.

[0045] The counter shaft 14 is arranged in parallel with the follower pulley 13, and these follower pulley 13 and the counter shaft 14 are connected by one pair of counter gear 15 and 16. Moreover, other gears 17 attached in this counter shaft 14 have geared to the output gear 18. This output gear 18 is the ring wheel of differential equipment as an example.

[0046] An operation of the hybrid driving gear mentioned above next is explained. With the equipment concerning this invention mentioned above, it is a brake B1. And each clutch C1 and C2 If various kinds of transit (operation) modes are possible and this is shown in a table according to an engagement condition, it will be as drawing 2 . In addition, in drawing 2 and this, and other drawings of the same kind, x mark shows a release (un-operating) condition, and O mark shows an engagement (actuation) condition. Hereafter, each operation mode is explained.

[0047] First, engine starting mode is explained. This mode is the mode which puts an engine 1 into operation by the idle state of a car, and is a brake B1. You make it engaged. That is, the ring wheel 5 of the epicyclic gear device 3 is fixed to casing 9. In addition, it adds to this and is the 2nd clutch C2. You may make it engaged and an output shaft 10 may be fixed. If a motor generator 2 is driven to an opposite direction with the hand of cut of an engine 1 in this condition and inverse rotation of the carrier 8 is carried out, a sun gear 4 will carry out forward rotation by fixing the ring wheel 5. That is, since the engine 1 connected with the sun gear 4 is made to carry out forward rotation, an engine 1 starts by starting supply of a fuel to coincidence, and lighting, if it is a gasoline engine.

[0048] This condition is shown in drawing 3 as a collinear Fig. In addition, in drawing 3 and this, and other drawings of the same kind, "S" shows a sun gear 4, "R" shows a ring wheel 5 and "CR" \*\* a carrier 8. Moreover, the arrow head shows the direction of torque. Furthermore, rho shows the ratio (gear ratio) of the number of teeth of a sun gear and a ring wheel. In drawing 3 , if a carrier 8 is rotated in the direction of inverse rotation with a motor generator 2 where a ring wheel 5 is fixed, a sun gear 4 will be made to carry out forward rotation, and the engine 1 connected with the sun gear 4 will be started.

[0049] The ETC mode at the time of advance transit is explained below. This ETC mode is the mode as which the equipment mentioned above is operated as a torque converter, and is the 2nd above-mentioned clutch C2. You make it engaged and an output shaft 10 is connected with a ring wheel 5. In this mode, an engine 1 is operated in the for example most efficient condition, and to this, a motor generator 2 is driven so that the torque produced in a ring wheel 5 may become a thing in alignment with the demand of transit. The collinear Fig. showing this condition is as drawing 4 , when the engine 1 is driving, forward torque has arisen in the sun gear 4, the torque of a negative direction is acting on a ring wheel 5 with the load for making it run a car to this, and the torque which a motor generator 2 outputs to a carrier 8 further is acting in the forward direction. If inverse rotation of the motor generator 2 is carried out in

this condition, as the engine speed of a ring wheel 5 falls and the continuous line has shown to drawing 4 depending on the engine speed of a motor generator 2, the engine speed of a ring wheel 5 becomes zero, and it will be in the condition that the car stopped. That is, a car is maintainable to a idle state, driving an engine 1.

[0050] Moreover, since the engine speed of an engine 1 and the sun gear 4 of this and one is uniformly maintained if the output torque of the forward direction of a motor generator 2 is increased from the condition shown in drawing 4 as a continuous line and the engine speed is increased to a forward hand of cut (if the engine speed of the direction of inverse rotation is decreased), as a broken line shows to drawing 4 , the ring wheel 5 which is an output element rotates in the forward direction. And the torque turns into torque which made the inputted torque amplify according to gear ratio rho of the epicyclic gear device 3. That is, a magnification operation of torque arises. In other words, the assistant operation by the motor generator 2 arises.

[0051] Furthermore, motor mode is explained. This mode is the mode it runs only with the power of a motor generator 2, and is the 1st clutch C1. You make it engaged and a motor generator 2 is driven in that condition. In this condition, since it will be in the condition that the motor generator 2, the carrier 8, and the output shaft 10 were linked directly, the power of a motor generator 2 is transmitted to an output shaft 10 as it is, and can run with a motor generator 2.

[0052] Furthermore, engine motor (Eng+ motor) mode is explained. This mode is the so-called direct connection transit mode, and is the 1st clutch C1. The 2nd clutch C2 You make it engaged. These clutches C1 and C2 Since a carrier 8 and a ring wheel 5 are connected through an output shaft 10 by being engaged, the whole epicyclic gear device 3 is unified. Namely, an engine 1 and a motor generator 2 will be in the condition of having been directly linked with the output shaft 10. Therefore, the power outputted from the engine 1 and the motor generator 2 is inputted into a change gear 11 through an output shaft 10 as it is.

[0053] Below, the mode for go-astern transit is explained. Transit with the power of transit with the power of an engine 1, transit with the power of a motor generator 2, an engine 1, and a motor generator 2 is possible for go-astern transit. First, when engine mode is explained, in this mode, it is the 1st clutch C1. While making it engaged and connecting an output shaft 10 with a carrier 8, it is a brake B1. You make it engaged and a ring wheel 5 is fixed. The collinear Fig. showing this condition is as drawing 5 , and if an engine 1 is driven, where a ring wheel 5 is fixed, when a sun gear 4 carries out forward rotation, a carrier 8 will carry out inverse rotation of it. That is, with the hand of cut of an engine 1, when an output shaft 10 rotates to an opposite direction, go-astern transit is carried out with the power of an engine 1.

[0054] Moreover, motor go-astern mode is the 1st clutch C1. You make it engaged. This is the same as that of the motor mode in the advance transit mentioned above, and since it will be directly linked with an output shaft 10 by the motor generator 2, an output shaft 10 carries out inverse rotation of it by carrying out inverse rotation of the motor generator 2. That is, go-astern transit is carried out with the power of a motor generator 2.

[0055] In the engine motor (Eng+ motor) mode in go-astern transit, it is the 1st clutch C1. Brake B1 You make it engaged. Although this is in the same condition as the engine mode in go-astern transit and the output shaft 10 connected with a carrier 8 and this by driving an engine 1 carries out inverse rotation, since the motor generator 2 is always connected with the carrier 8, by driving a motor generator 2 in the direction of inverse rotation, the power is transmitted to an output shaft 10, and the driving force for go-astern transit increases. That is, driving force can be assisted with a motor generator 2.

[0056] Thus, in the hybrid driving gear shown in drawing 1 , in ETC mode, the torque outputted with the engine 1 can be amplified by inputting the torque of a motor generator 2 into the epicyclic gear device 3, and can be outputted to an output shaft 10. Moreover, rotation of an output shaft 10 can be stopped, driving an engine 1 by controlling the engine speed of a motor generator 2. Therefore, the epicyclic gear device 3 can be similarly operated with a torque converter.

[0057] Furthermore, when carrying out go-astern transit, the change gear which can run only with the power of an engine 1, therefore cannot set up an astern stage like the above-mentioned belt type nonstep

variable speed gear as a change gear 11 can be adopted. And with the power of a motor generator 2, an engine 1 can be rotated and an engine 1 can be put into operation again. Therefore, the starter motor needed conventionally can be abolished in the above-mentioned hybrid driving gear.

[0058] It is the 2nd clutch C2 in the ETC mode in the case of the advance transit in the above-mentioned hybrid driving gear. In the case of go-astern transit connect an output shaft 10 with a ring wheel 5, and according to the power of an engine 1, it is the 1st clutch C1. An output shaft 10 is connected with a carrier 8. Thus, by changing the rotation element which connects an output shaft 10, the go-astern transit with the so-called ETC mode and the so-called engine 1 is attained, therefore they are each above-mentioned clutch C1 and C2. It is the so-called output switch clutch.

[0059] The example which materialized the hybrid driving gear mentioned above is shown in drawing 6 thru/or drawing 8. The hybrid driving gear shown here has the front case 20, the mid case 21, and the rear case 22, and casing 23 is formed by these 3 person. The front case 20 is constituted so that it may connect with an engine, and the septum section 25 which has the through tube which made in agreement an engine output shaft 24 and an engine axis is formed in the interior. On both sides of this septum section 25, with the engine, covering 26 is attached in the opening edge of the opposite side, and the motor housing 27 is formed between this covering 26 and the septum section 25. The motor generator 28 is held in the interior of this motor housing 27.

[0060] The through tube which made said output shaft 24 and axis in agreement like the septum section 25 is formed in said covering 26, and Rota 30 is held free [ rotation ] by the bearing 29 which carried out fitting to the inner circumference section of these septa section 25, and the inner circumference section of covering 26. This Rota 30 attaches a permanent magnet in the periphery section of the flange projected outside by radial from the boss section supported by bearing 29, and the stator 31 is arranged in the location which counters by radial [ that / permanent magnet and radial ]. This stator 31 is being fixed to the inner skin of the front case 20. Moreover, the resolver 32 is arranged between the boss section of Rota 30, and the internal surface of covering 26. In addition, in order to secure the fluid-tight nature of a motor housing 27, as for said bearing 29, it is desirable that it is the bearing equipped with the sealant.

[0061] The centrum 33 of a fluid-tight structure is formed in the periphery side of said motor housing 27, and by pouring cooling water to this centrum 33, it is constituted so that a motor generator 28 may be cooled. That is, this centrum 33 serves as a water jacket.

[0062] The boss section of said Rota 30 is formed in the shape of a hollow shaft, and is inserted in the interior of the boss section free [ rotation of an input shaft 34 ]. This input shaft 34 penetrated said septum section 25, and has projected it to the engine side, and that protrusion edge is connected with the engine output shaft 24 through the drive plate 35. That is, a drive plate 35 is a large plate of the moment of inertia which enlarged mass by the side of a periphery, and is attached in the engine output shaft 24. Moreover, this drive plate 35 is equipped with the absorber device 36 in which it has elastic bodies, such as an arranged coil spring towards a hand of cut, and the boss section of that absorber device 36 has fitted into the point of said input shaft 34 in one.

[0063] The septum section 37 which has the through tube which made the input shaft 34 and the axis in agreement in the mid case 21 connected with the above-mentioned front case 20 is formed in the pars intermedia in the direction of an axis. To the centrum currently formed between this septum section 37 and said covering 26, they are the epicyclic gear device 38 and a brake B1. And two clutches C1 and C2 It is contained.

[0064] This epicyclic gear device 38 is an epicyclic gear device of the double pinion mold mentioned above, adjoins said covering 26 and is arranged. The sun gear 39 in this epicyclic gear device 28 is formed in said input shaft 34 and one. Moreover, the boss section of said Rota 30 is prolonged in the epicyclic gear device 38 side along with the peripheral face of an input shaft 34, and spline fitting of the carrier 40 is carried out to the tip periphery section of the boss section (namely, hollow shaft section). The guide plate 41 which leads the lubricating oil which disperses in radial to a pinion gear side is attached in the side face by the side of the covering 26 of this carrier 40.

[0065] The retainer 43 which a ring wheel 42 is a cylinder-like member and supports this to the direction

of an axis and radial is the inner skin of a ring wheel 42, and is connected with the end section in the direction of an axis. This retainer 43 is positioned to radial by being positioned to the direction of an axis by thrust bearing which it has been arranged between a carrier 40 and covering 26, and has been arranged between these carriers 40 and covering 26, and fitting into the boss section of a carrier 40 free [ rotation ].

[0066] The brake hub 44 which makes the shape of a cylinder is being fixed to the peripheral face of a ring gear 42 in one. The file plate of two or more sheets made [ this brake hub 44 ] to carry out spline fitting and the file plate which carried out spline fitting to the inner skin of the mid case 21 are arranged by turns in the direction of an axis, and it is a brake B1 by these file plates. It is constituted.

[0067] In a part for the intersection of said septum section 37 and inner skin of the mid case 21, it is a brake B1. The centrum which carried out opening towards the side is formed, and it is arranged so that a piston 45 may carry out longitudinal slide movement to this centrum in the direction of an axis. The point of this piston 45 is said brake B1. By having extended even in near, therefore supplying oil pressure to the tooth-back side of this piston 45, when a piston 45 moves rightward [ of drawing 6 ] and presses a file plate, it is a brake B1. It is constituted so that you may make it engaged.

[0068] In the inner circumference side of a piston 45, it is the 2nd clutch C2. The clutch drum 46 of \*\* is arranged. This clutch drum 46 is material cylinder-like centrum material which has the side-attachment-wall section in alignment with said septum section 37, and is held by the boss section of the septum section 37 free [ rotation ]. While the tip of said brake hub 44 carries out spline fitting, the file plate of two or more sheets is made to carry out spline fitting to the inner skin in the cylinder part of this clutch drum 46, and other file plates are arranged by turns among these file plates. A file plate besides these is the 1st clutch C1 arranged to the inner circumference side of the clutch drum 46. Spline fitting is carried out at the peripheral face of the clutch drum 47 of \*\*, therefore it is the 2nd clutch C2 by these file plates. It is constituted.

[0069] These file plates are pressed and it is the 2nd clutch C2. It is contained so that the piston 48 made engaged may carry out longitudinal slide movement to the inner circumference section of said clutch drum 46 in the direction of an axis. Supply of the oil pressure to the tooth-back side of this piston 48, i.e., the interior of the clutch drum 46, is constituted so that it may carry out through the oilway formed in said septum section 37. Furthermore, the return spring 49 held by the retainer is arranged at the front-face side (right-hand side in drawing 6 ) of this piston 48.

[0070] An output shaft 50 penetrates, it is held free [ rotation ] at the inner circumference side of the septum section 37, and the back end section (edge on the right-hand side of drawing 6 ) of this output shaft 50 has fitted into the point of said input shaft 34 free [ rotation ]. The flange projected to radial is formed in the edge by the side of the input shaft 34 in this output shaft 50, and said clutch drum 47 is connected here in one. Therefore, the 2nd clutch C2 It is constituted so that a ring gear 42 and an output shaft 50 may be connected alternatively.

[0071] This clutch drum 47 is the 1st clutch C1. It is \*\*, and spline fitting of the file plate of two or more sheets is carried out to that inner skin, and these file plates and the file plate arranged by turns in the direction of an axis are made to carry out spline fitting to the peripheral face of the clutch hub 51 made to unite with said carrier 40. That is, it is the 1st clutch C1 by the file plate of \*\*\*\*\*. It is constituted. This 1st clutch C1 The piston 52 made engaged is held by the flange extended to radial [ of an output shaft 50 ]. The oil pressure which operates this piston 52 is constituted so that the tooth-back side of a piston 52 may be supplied through the interior of an output shaft 50 from said septum section 37. The return spring 53 which carries out return actuation of this piston 52 is arranged at the front-face side of a piston 52.

[0072] In addition, in the hybrid driving gear mentioned above, as shown in drawing 6 , while enlarging torque generated with a motor generator 28 by arranging Rota 30 and a stator 31 to a periphery side as much as possible, by making a part of epicyclic gear device 38 enter into the space section produced in the inner circumference side of a stator 31, a tooth space is used effectively and the dimension in the direction of an axis is shortened.

[0073] The change gear 54 is arranged at the centrum between the rear case 22 connected with the mid

case 21, and said septum section 37. This change gear 54 is a belt-type nonstep variable speed gear, as mentioned above, and the driving pulley 55 is arranged on the same axis as an output shaft 50. This driving pulley 55 consists of a fixed sheave 56 and a movable sheave 57, the wall surface which these sheaves 56 and 57 counter is a taper side, and the slot which puts a belt 58 is formed of these taper sides. The fixed sheave 56 is equipped with the hollow-like shank, and is supported by said septum section 37 free [ rotation ] through the bearing 59 which carried out fitting to the periphery side of the end section of the shank, and the point of said output shaft 50 is inserted in the centrum, and spline fitting of it is carried out to it. The other-end section of the movable sheave 56 is held free [ rotation ] by the bearing 60 attached in the inner circumference section of the rear case 22. Fitting of the slide of the movable sheave 57 in the direction of an axis is made possible to the periphery side of the hollow shaft section in this fixed sheave 56. This movable sheave 57 is constituted so that it may be moved to the fixed sheave 56 side by the double piston type hydraulic servomechanism 61.

[0074] The follower pulley 62 is formed in parallel with the above-mentioned driving pulley 55. This follower pulley 62 consists of a fixed sheave 63 and a movable sheave 64 as well as a driving pulley 55, and it is constituted so that a belt 58 may be wrapped around the slot between each of these sheaves 63 and 64. The fixed sheave 63 has the shank in the air, and the edge (edge on the left-hand side of drawing 7 ) of one of these is held free [ rotation ] in the rear case 22 through bearing 65, and the other-end section is held by the septum section 37 free [ rotation ] through bearing 66. Fitting of the movable sheave 64 is carried out so that it can move in the direction of an axis at the periphery of the hollow shaft section in this fixed sheave 63. Between the hollow shaft sections of this movable sheave 64 and the fixed sheave 63, while moving the movable sheave 64 in the direction of an axis smoothly, in order to make it rotate in one with the fixed sheave 63, the ball spline 67 is formed. The hydraulic servomechanism 68 which presses the movable sheave 64 to the fixed sheave 63 side is formed in the tooth-back side (right-hand side of drawing 7 ) of this movable sheave 64.

[0075] Although control of the change gear ratio of this change gear 54 is performed by supplying oil pressure to each hydraulic servomechanisms 61 and 68, that control is the same as control by the conventional belt type nonstep variable speed gear almost. That is, the oil pressure according to demand torque is supplied to the hydraulic servomechanism 68 by the side of the follower pulley 62, and the oil pressure which sets up the change gear ratio demanded is supplied to the hydraulic servomechanism 61 by the side of a driving pulley 55 to this. That is, with the oil pressure by the side of the follower pulley 62, while giving predetermined tension to the belt 58, by making high oil pressure by the side of a driving pulley 55, the flute width of a driving pulley 55 becomes narrow, a belt 58 winds, and a credit radius becomes large, consequently a change gear ratio becomes small. If the oil pressure by the side of the drive pulley 55 is reduced contrary to this, since the flute width of a driving pulley 55 can extend with the tension concerning a belt 58, consequently a belt 58 will wind and a credit radius will become small, it is constituted so that a change gear ratio may become large.

[0076] Inside said output shaft 50 and the fixed sheave 56, the pump shaft 69 penetrated along with the medial-axis line is arranged, and spline fitting of one edge of the pump shaft 69 is carried out to an input shaft 34. The chain sprocket 70 is attached in the point of this pump shaft 69. This chain sprocket 70 is for transmitting driving force to the oil pump which is not illustrated. Moreover, this chain 70 and chain which is not illustrated are covered with the end cover 71. Moreover, in drawing 7 , a sign 72 is a parking gear and spline fitting is carried out to the fixed sheave 63 in the follower pulley 62.

[0077] Said front case 20 and mid case 21 are equipped with the part projected to radial, and the counter shaft 73 and the differential 74 are contained by the amount of the lobe. A counter shaft 73 is a comparatively short revolving shaft, and it is connected with the shank of the fixed sheave 63 in said follower pulley 62 by the counter gear 76 of a pair while holding the both ends free [ rotation ] by bearing 75. Moreover, other gearings 77 are formed in this counter shaft 73 at one, and this gearing 77 meshes with the ring gear 78 (output gear) in a differential 74. In addition, in drawing 6 , a sign 79 shows a seal member and is changing the seal of between the septa 25 and input shafts 34 in the front case 20 into the fluid-tight condition.

[0078] If it is the configuration shown in drawing 6 thru/or drawing 8 mentioned above, the motor

generator 28 with a large outer diameter will adjoin a drive plate 35, and it will be arranged, and it is a brake B1. A clutch C1 and C2 Since it is arranged at the nonstep variable speed gear 54 side, it has composition which the member which the outer-diameter dimension approximated is made to adjoin mutually, consequently can consider as equipment compact as a whole.

[0079] Other examples of this invention are explained below. The example shown in drawing 9 changes arrangement and connection relation of a configuration of being shown in drawing 1 mentioned above. That is, the engine 1 is always connected with the carrier 8, and the motor generator 2 is always connected with the sun gear 4 to this. Thus, it is the 1st clutch C1 by having changed from the configuration which shows the connection relation between an engine 1 and a motor generator 2 to drawing 1. It is arranged so that an output shaft 10 and a sun gear 4 may be connected alternatively. Moreover, a motor generator 2 sandwiches a change gear 11, and is each clutch C1 and C2. It is arranged in the opposite side. Therefore, the shaft which connects a motor generator 2 and a sun gear 4 has penetrated along with the medial-axis line of a driving pulley 12.

[0080] Also in the hybrid driving gear shown in drawing 1 also in the hybrid driving gear of a configuration of being shown in this drawing 9, the same transit mode (operation mode) is possible. That is, as shown in drawing 10, at engine starting mode, it is the 2nd clutch C2. Brake C1 You make it engaged. Therefore, since a sun gear 4 is made rotated with a motor generator 2 where a ring wheel 5 is fixed, a carrier 8 rotates to an opposite direction in a sun gear 4. The engine 1 connected with a carrier 8 and this carries out forward rotation by the collinear Fig.'s having shown this condition to drawing 11, and carrying out inverse rotation of the motor generator 2. Therefore, an engine 1 can be put into operation by supplying a fuel to an engine 1 in this condition, and lighting if needed.

[0081] The ETC mode in the case of advance transit is the 2nd clutch C2. It sets up by making it engaged. It is set up by this being the same as that of the example shown in drawing 1, and connecting with an output shaft 10 the rotation element with which the engine 1 or the motor generator 2 is not connected. Since the motor generator 2 and the engine 1 are connected with the sun gear 4 and carrier 8 which serve as a reaction force element mutually when the ring wheel 5 connected with the output shaft 10 is fixed in this condition An engine 1 for example, by operating in the most efficient condition and controlling the output of a motor generator 2 by the condition The torque which rotation of the output shaft 10 connected with a ring wheel 5 and this stopped, and amplified the output torque of an engine 1 to the output shaft 10 arises, and the epicyclic gear device 3 functions as a torque converter similarly. The collinear Fig. in this mode is shown in drawing 12.

[0082] Motor transit mode is the 1st clutch C1. You make it engaged and it sets up. That is, a motor generator 2 is connected with an output shaft 10 through a sun gear 4. Therefore, it can run with the power of a motor generator 2. In that case, the 2nd clutch C2 If you make it engaged, since the whole epicyclic gear device 3 will really rotate, the engine 1 connected with the carrier 8 carries out forward rotation. Therefore, an engine 1 can be started in motor transit mode.

[0083] The transit mode (Eng+ motor mode) by the engine 1 and the motor generator 2 is the mode which is made to unify the whole epicyclic gear device 3, and links an engine 1 and a motor generator 2 with an output shaft 10 directly, and this is the 1st clutch C1 and the 2nd clutch C2. You make it engaged and it sets up. It is the same as that of the engine motor mode in the equipment shown in drawing 1.

[0084] At the time of go-astern, it can run with both an engine 1, and both [ either or ] 2. That is, when carrying out go-astern transit under the power of an engine 1, it is the 1st clutch C1. And brake B1 It is made to be engaged, and while fixing a ring wheel 5, where a sun gear 4 is connected with an output shaft 10, forward rotation of the carrier 8 is carried out with an engine 1. Consequently, since the output shaft 10 connected with a sun gear 4 and this carries out inverse rotation as a collinear Fig. is shown in drawing 13, go-astern transit will be carried out.

[0085] Moreover, since what is necessary is just to link a motor generator 2 with an output shaft 10 directly when carrying out go-astern transit with a motor generator 2, it is the 1st clutch C1. You make it engaged. Moreover, it is the 2nd clutch C2 in that case. It is made to engage with coincidence and you may make it not produce relative rotation of the rotation elements in the epicyclic gear device 3. This is



the same also in the equipment shown in drawing 1 .

[0086] When carrying out go-astern transit under the power of both an engine 1 and the motor generator 2, it is the 1st clutch C1. Brake B1 You make it engaged. Since a carrier 8 is rotated with an engine 1 where this was the same as that of the engine mode at the time of go-astern transit and a ring wheel 5 is fixed, the output shaft 10 connected with a sun gear 4 and this will carry out inverse rotation, and will be in a go-astern run state. In that case, go-astern transit can be carried out with the power of an engine 1 and a motor generator 2 by carrying out inverse rotation of the motor generator 2, and adding the torque of the direction of inverse rotation to a sun gear 4.

[0087] Thus, in the hybrid driving gear constituted as shown in drawing 9 , since go-astern transit can be carried out with the power of an engine 1, even if it is the case where the charge capacity of a dc-battery (not shown) is falling, the driving force in the case of go-astern transit is not insufficient. Moreover, since the torque which the so-called ETC mode is possible and an engine 1 outputs can be amplified with a motor generator 2 and it can output from an output shaft 10, sufficient driving torque required at the time of start etc. can be acquired, maintaining an engine 1 to the optimal operational status.

Moreover, especially with the configuration shown in drawing 9 , since a motor generator 2 can be arranged in the end section in the direction of an axis, cooling of a motor generator 2 becomes easy.

[0088] With the configuration shown in this drawing 9 , a carrier 8 always carries out forward rotation so that it may be known from the above-mentioned explanation. This is used and it is an oil pump Op. It can consider as the built-in configuration. The example is shown in drawing 14 . The configuration shown in this drawing 14 improves the configuration shown in drawing 9 , and is an oil pump Op to a carrier 8. While being connected, it is a clutch C0 between a carrier 8 and an engine 1. It is arranged and is a brake B1 further. It is an one way clutch F1 to juxtaposition. It is arranged. Other configurations are the same as the configuration shown in drawing 9 .

[0089] Even if it is in which transit mode of advance and go-astern, when a carrier 8 carries out forward rotation with such a configuration, it is an oil pump Op. It can drive normally and required oil pressure can be generated.

[0090] Each example mentioned above may be constituted although it is the example constituted so that an output element might be changed, in addition so that the element which inputs the power of a motor generator 2 may be changed. The example is indicated to drawing 15 . The example shown in this drawing 15 improves the configuration shown in drawing 1 , and is the 1st input clutch C1 between a motor generator 2 and a ring wheel 5. It is arranged. Moreover, it is the 2nd input clutch C2 between a motor generator 2 and a carrier 8. It is arranged. Further between a carrier 8 and an output shaft 10 The 1st output clutch C3 equivalent to the 1st clutch shown in drawing 1 The 2nd output clutch C4 equivalent to the 2nd clutch which it is arranged and is shown between a ring wheel 5 and an output shaft 10 at drawing 1 It is arranged. Furthermore, it changes to the brake shown in drawing 1 , and is an one way clutch F1. It is arranged between a ring wheel 5 and casing 9.

[0091] It explains, the operation of a hybrid driving gear, i.e., each transit mode, shown in this drawing 15 . When according to this hybrid driving gear the seven modes shown in drawing 16 can be set up and engine starting mode is explained first, in this mode, it is the 2nd input clutch C2. You make it engaged. That is, a motor generator 2 is connected with a carrier 8. The collinear Fig. of this condition is shown in drawing 17 . If inverse rotation of the carrier 8 is carried out with a motor generator 2, since the load of an engine 1 is applied to the sun gear 4, a ring wheel 5 tends to carry out inverse rotation. One way clutch F1 connected with this ring wheel 5 Since it is constituted so that it may be engaged, when the torque of the direction of inverse rotation acts on the member by the side of rotation (for example, inner race), the engine 1 which a ring wheel 5 is fixed, consequently has been connected with a sun gear 4 and this carries out forward rotation by carrying out inverse rotation of the motor generator 2. Therefore, an engine 1 can be put into operation by supplying a fuel to an engine 1 in the condition, and lighting if needed. In addition, at this engine starting mode, it is the 2nd output clutch C4. You may make it engaged and rotation of an output shaft 10 may be stopped.

[0092] Moreover, the ETC mode in the case of advance transit is the 2nd input clutch C2. The 2nd output clutch C4 You make it engaged and it sets up. That is, a motor generator 2 is connected with a

carrier 8, and an output shaft 10 is connected with a ring wheel 5. This will be in the same connection condition as the ETC mode in the case of advance transit with the hybrid driving gear shown in drawing 1, and the I/O condition of power. Therefore, rotation of an output shaft 10 can be stopped, being able to amplify the torque which an engine 1 outputs with a motor generator 2, and being able to output to an output shaft 10, and rotating an engine 1 so that clearly also from the collinear Fig. shown in drawing 18.

[0093] Moreover, motor transit mode is the 2nd input clutch C2. The 1st output clutch C3 You make it engaged and it sets up. That is, while connecting a motor generator 2 with a carrier 8, a motor generator 2 and an output shaft 10 are directly linked through a carrier 8 by connecting an output shaft 10 with a carrier 8. Therefore, advance transit can be carried out with the power of a motor generator 2.

[0094] Any three of said four clutches are made engaged in engine motor mode. For example, as shown in drawing 16, they are each input clutch C1 and C2. The 1st output clutch C3 You make it engaged. Therefore, while a motor generator 2 is connected with the epicyclic gear device 3, the whole epicyclic gear device 3 is unified and an output shaft 10 is connected with the carrier 8 of the unified epicyclic gear device 3. Therefore, the power of an engine 1 and a motor generator 2 is transmitted to an output shaft 10 through the epicyclic gear device 3, and can carry out advance transit with the power of an engine 1, and the power of a motor generator 2.

[0095] Engine mode and motor mode are possible as the mode for go-astern transit. In engine mode, it is the 1st input clutch C1. The 1st output clutch C3 You make it engaged. That is, while connecting a motor generator 2 with a ring wheel 5, an output shaft 10 is connected with a carrier 8. The collinear Fig. of this condition is shown in drawing 19. If an engine 1 is driven and the torque of a forward hand of cut is transmitted to a sun gear 5, since the load from an output shaft 10 is applied to the carrier 8, the torque of a forward hand of cut arises in a ring wheel 5. If the torque which overcomes this is given to a ring wheel 5 with a motor generator 2, the rotational frequency of a ring wheel 5 will be controlled and the output shaft 10 connected with a carrier 8 and this in connection with it will carry out inverse rotation. In addition, in a ring wheel 5, it is an one way clutch F1. Since it has connected, it is an one way clutch F1. It is possible to reduce rotation of the forward hand of cut of a ring wheel 5 until rotation is stopped. That is, the engine mode in the case of this go-astern transit will set up a go-astern run state with a motor generator 2, and will control that driving torque by the motor generator 2.

[0096] On the other hand, the motor mode for go-astern transit is the mode which links a motor generator 2 with an output shaft 10 directly, therefore is the 2nd input clutch C2 like the motor mode in the case of advance transit. The 1st output clutch C3 You make it engaged. In this condition, since a motor generator 2 and an output shaft 10 are in a direct connection condition, by carrying out inverse rotation of the motor generator 2, an output shaft 10 carries out inverse rotation, and carries out go-astern transit.

[0097] In addition, the example shown in above-mentioned drawing 15 can be performed about the configuration which shows the same modification as this to drawing 9, although it is the example which carried out additional installation of the clutch device among configurations of being shown in drawing 1 between a carrier 8 and a motor generator 2 and between the ring wheel 5 and the motor generator 2, and changed the brake into the one way clutch. That is, since the means which separates a motor generator 2 from the epicyclic gear device 3 will be established, when it runs under the power of an engine 1 and there is no need for a generation of electrical energy, a motor generator 2 can be separated and loss of power can be prevented.

[0098] The example which changed to said double pinion mold epicyclic gear device next, and used the single pinion mold epicyclic gear device is explained. Drawing 20 shows the example and the single pinion mold epicyclic gear device 80 in which compound and the power of an engine 1 and a motor generator 2 is individually transmitted to an output shaft 10 is a gearing device which used as the rotation element the carrier 84 which held the pinion gear 83 which geared to the sun gear 81 which is an external-tooth gearing, the ring wheel 82 which is the internal gear arranged on a concentric circle to the sun gear 81, and these sun gears 81 and a ring wheel 82 free [ rotation and revolution ].

[0099] While a motor generator 2 is connected with the sun gear 81, it is the 1st clutch C1. It minds and

the output shaft 10 is connected. Moreover, the engine 1 is connected with the ring wheel 82.

Furthermore, brake B1 which fixes a carrier 84 alternatively While being prepared, the 2nd clutch C2 is formed between this carrier 84 and output shaft 10. That is, the configuration shown in this drawing 20 changes into a single pinion mold epicyclic gear device the double pinion mold epicyclic gear device in the configuration shown in drawing 9 mentioned above, and replaces the connection relation between a power plant or friction engagement equipment in a carrier and a ring wheel in connection with it.

[0100] Therefore, also in the hybrid driving gear of a configuration of being shown in drawing 20 , the same transit mode as the equipment of a configuration of being shown in drawing 9 can be set up, and they are the clutch C1 in each mode, and C2. And brake B1 Engagement / release condition is the same as that of the equipment shown in drawing 9 . The engagement actuation table for setting each transit mode as drawing 21 is shown. In addition, at drawing 21 , it is the 2nd clutch C2 in the motor mode in the case of advance transit and go-astern transit. It is the 2nd clutch C2 like the case where it is based on the equipment shown in drawing 9 since the whole epicyclic gear device 80 unifies in motor mode although released. It is good also as making it engaged.

[0101] Hereafter, each transit mode is explained. At engine starting mode, it is the 2nd clutch C2. Brake B1 You make it engaged. Therefore, since a sun gear 81 is made rotated with a motor generator 2 where a carrier 84 is fixed, a ring wheel 82 rotates to an opposite direction in a sun gear 81. The engine 1 connected with a ring wheel 82 and this carries out forward rotation by the collinear Fig.'s having shown this condition to drawing 22 , and carrying out inverse rotation of the motor generator 2. Therefore, an engine 1 can be put into operation by supplying a fuel to an engine 1 in this condition, and lighting if needed.

[0102] The ETC mode in the case of advance transit is the 2nd clutch C2. It sets up by making it engaged. That is, the rotation element with which the engine 1 or the motor generator 2 is not connected is connected with an output shaft 10. Since the motor generator 2 and the engine 1 are connected with the sun gear 81 and ring wheel 82 which serve as a reaction force element mutually when the carrier 84 connected with the output shaft 10 is fixed in this condition An engine 1 for example, by operating in the most efficient condition and controlling the output of a motor generator 2 by the condition The torque which rotation of the output shaft 10 connected with a carrier 84 and this stopped, and amplified the output torque of an engine 1 to the output shaft 10 arises, and the epicyclic gear device 80 functions as a torque converter similarly. The collinear Fig. in this mode is shown in drawing 23 .

[0103] Motor transit mode is the 1st clutch C1. You make it engaged and it sets up. That is, a motor generator 2 is connected with an output shaft 10. Therefore, it can run with the power of a motor generator 2.

[0104] The transit mode (Eng+ motor mode) by the engine 1 and the motor generator 2 is the mode which is made to unify the whole epicyclic gear device 80, and links an engine 1 and a motor generator 2 with an output shaft 10 directly, and this is the 1st clutch C1. And the 2nd clutch C2 You make it engaged and it sets up. It is the same as that of the engine motor mode in the equipment shown in drawing 1 or drawing 9 .

[0105] At the time of go-astern, it can run with both an engine 1, and both [ either or ] 2. That is, when carrying out go-astern transit under the power of an engine 1, it is the 1st clutch C1. And brake B1 It is made to be engaged, and while fixing a carrier 84, where a sun gear 81 is connected with an output shaft 10, forward rotation of the ring wheel 82 is carried out with an engine 1. Consequently, since the output shaft 10 connected with a sun gear 81 and this carries out inverse rotation as the collinear Fig. is shown in drawing 24 , go-astern transit will be carried out.

[0106] Moreover, since what is necessary is just to link a motor generator 2 with an output shaft 10 directly when carrying out go-astern transit with a motor generator 2, it is the 1st clutch C1. You make it engaged. Moreover, it is the 2nd clutch C2 in that case. It is made to engage with coincidence and you may make it not produce relative rotation of the rotation elements in the epicyclic gear device 80.

[0107] When carrying out go-astern transit under the power of both an engine 1 and the motor generator 2, it is the 1st clutch C1. Brake B1 You make it engaged. Since a ring wheel 82 is rotated with an engine 1 where this was the same as that of the engine mode at the time of go-astern transit and a carrier 84 is

fixed, the output shaft 10 connected with a sun gear 81 and this will carry out inverse rotation, and will be in a go-astern run state. In that case, go-astern transit can be carried out with the power of an engine 1 and a motor generator 2 by carrying out inverse rotation of the motor generator 2, and adding the torque of the direction of inverse rotation to a sun gear 81.

[0108] Thus, in the hybrid driving gear constituted as shown in drawing 20 , since go-astern transit can be carried out with the power of an engine 1, even if it is the case where the charge capacity of a dc-battery (not shown) is falling, the driving force in the case of go-astern transit is not insufficient.

Moreover, since the torque which the so-called ETC mode is possible and an engine 1 outputs can be amplified with a motor generator 2 and it can output from an output shaft 10, sufficient driving torque required at the time of start etc. can be acquired, maintaining an engine 1 to the optimal operational status.

[0109] It is an oil pump Op to the configuration shown in drawing 20 . The added configuration is shown in drawing 25 . It is [ a ring wheel 82, that of an engine 1, and ] a clutch C0 in between. It is arranged and is an oil pump Op to the output shaft of the engine 1. It is connected. Moreover, brake B1 It is an one way clutch F1 to juxtaposition. It is arranged. Other configurations are the same as the configuration shown in drawing 20 .

[0110] In addition, in the example shown in drawing 20 , a motor generator 2 is arranged in the center section in the direction of an axis, and they are the epicyclic gear device 3, a clutch C1, and C2 to the both sides. Although considered as the arranged configuration, a change gear 11 is adjoined and a motor generator 2 is arranged, and they are a clutch C1 and C2. It is better than the epicyclic gear device 3 also as a configuration arranged to an engine 1 side.

[0111] It constitutes so that it may be possible to carry out go-astern transit with the power of an engine 1 by changing with a clutch the rotation element which connects an output shaft 10, but by changing the method of an input of power over an epicyclic gear device, each example explained above can also be constituted so that go-astern transit with an engine 1 may be possible. The example is explained below.

[0112] Drawing 26 is the example which used the RABINIYO mold epicyclic gear device 90. This RABINIYO mold epicyclic gear device 90 The 1st sun gear 91 which is an external-tooth gearing, and the ring wheel 92 which is the internal gear arranged on a concentric circle to this 1st sun gear 91, The carrier 95 which held the long pinion gear 94 which geared to the Short pinion gear 93 which gears to the 1st sun gear 91 arranged among these sun gears 91 and ring wheels 92, and this Short pinion gear 93 and ring wheel 92 free [ rotation and revolution ], It is the well-known epicyclic gear device equipped with the 2nd sun gear 96 which got into gear to the long pinion gear 94. The 1st clutch C1 which connects an engine 1 with the 1st sun gear 91 alternatively while a motor generator 2 is connected with the 2nd sun gear 96 The 2nd clutch C2 which connects an engine 1 with the 2nd sun gear 96 alternatively is formed. Furthermore, a brake B1 is formed between a carrier 95 and casing 9, and it is this brake B1. It is constituted so that a carrier 95 may be fixed alternatively. Furthermore, the output shaft 10 is connected with the ring wheel 92.

[0113] On the other hand, between the follower pulley 13 and casing 9, it is an one way clutch F1. 2nd brake B-2 It is arranged by the serial. This one way clutch F1 The member (for example, inner race) connected with the follower pulley 13 is 2nd brake B-2 in the follower pulley 13. It is constituted so that it may be engaged, when it rotates in the go-astern transit direction to a near member (for example, outer race) (inverse rotation). Therefore, 2nd brake B-2 By making it engaged, it is constituted so that the rotation to the go-astern transit direction of the follower pulley 13, a driving pulley 12, and an output shaft 10 may be prevented. Since other configurations are the same as the configuration shown in drawing 1 , they give the same sign as drawing 1 to drawing 26 , and omit the explanation.

[0114] Each transit mode (operation mode) shown in drawing 27 also in the hybrid driving gear of a configuration of being shown in this drawing 26 is possible. Hereafter, each of these modes are explained.

[0115] At engine starting mode, it is the 1st clutch C1. While making it engaged and connecting an engine 1 with the 1st sun gear 91, it is 2nd brake B-2. It considers as the condition of having made it engaged and having prevented the inverse rotation of an output shaft 10 92, i.e., a ring wheel. The

collinear Fig. of this condition is shown in drawing 28 . In addition, it sets to the following collinear Figs. and is rho 1. The ratio of the number of teeth of the 1st sun gear and a ring wheel, and rho 2 The ratio of the number of teeth of the 2nd sun gear and a ring wheel is shown, respectively, and it is S1. The 1st sun gear and S2 The 2nd sun gear is shown, respectively. Since inverse rotation of the 2nd sun gear 96 will be carried out where a ring wheel 92 is fixed when inverse rotation of the motor generator 2 is carried out, the 1st sun gear 91 rotates to an opposite direction to this 2nd sun gear 96. That is, since the engine 1 connected with the 1st sun gear 91 is made to carry out forward rotation with a motor generator 2, an engine 1 can be put into operation by supplying a fuel to an engine 1 and lighting if needed.

[0116] The ETC mode as which the epicyclic gear device 90 is similarly operated with a torque converter in the case of advance transit is possible. This is the 1st clutch C1. You make it engaged and an engine 1 is connected with the 1st sun gear 91. This condition serves as a configuration which connected the engine 1 and the motor generator 2 with the 2nd sun gear, the rotation element 91, i.e., 1st sun gear, which rotates to an opposite direction mutually, 96, when the ring wheel 92 which is the output element connected with an output shaft 10 and this is fixed. The collinear Fig. in this case is shown in drawing 29 . If a motor generator 2 is driven in the direction of inverse rotation in the condition of operating an engine 1 in the for example most efficient condition, and transmitting the power to the 1st sun gear 91 and inverse rotation of the 2nd sun gear 96 is carried out, according to the rotational frequency of the motor generator 2, rotation of a ring wheel 92 and the output shaft 10 of this and one will stop. The continuous line has shown the condition to drawing 29 .

[0117] if the output torque of the forward hand of cut of a motor generator 2 is increased from this condition, according to it, the rotational frequency (rotational frequency of a forward hand of cut) of the 2nd sun gear 96 will increase gradually (namely, the rotational frequency of the direction of inverse rotation -- gradually -- falling), and the rotational frequency to the forward hand of cut of the output shaft 10 connected with a ring wheel 92 and this in connection with it will increase gradually. Since the engine speed of the output shaft 10 is small as compared with the engine speed of an engine 1, the output torque turns into torque which amplified the output torque of an engine 1 with the motor generator 2. Thus, also in the hybrid driving gear of a configuration of being shown in drawing 26 , the epicyclic gear device 90 can be operated as a torque converter.

[0118] The motor mode in advance transit is the 1st brake B1. It sets up by making it engaged and fixing a carrier 95. In this condition, since the 2nd sun gear 96 and a ring wheel 92 serve as relation mutually rotated to an opposite direction, if inverse rotation of the motor generator 2 is carried out, a ring wheel 92 and the connected output shaft 10 will carry out forward rotation. That is, with the power of a motor generator 2, an output shaft 10 can be rotated and advance transit can be carried out. In addition, since the follower pulley 13 rotates in the advance transit direction in this case, it is an one way clutch F1. It is not engaged, therefore is 2nd brake B-2. You may make it engaged.

[0119] Engine motor mode is the mode in which the power of the power motor generator 2 of an engine 1 is transmitted to an output shaft 10, therefore is the 1st clutch C1 in this case. The 2nd clutch C2 You make it engaged. The 1st sun gear 91 and the 2nd sun gear 96 which are two rotation elements are a clutch C1 and C2. Since it is connected, the whole epicyclic gear device 90 is unified. Consequently, the power of an engine 1 and the power of a motor generator 2 are outputted to an output shaft 10 from a ring wheel 92 as it is.

[0120] If the three modes at the time of performing go-astern transit are possible and engine mode is explained first, when carrying out go-astern transit with the power of an engine 1, it is the 2nd clutch C2. While you make it engaged and an engine 1 is connected with the 2nd sun gear 96, it is a brake B1. You make it engaged and a carrier 95 is fixed. Since the collinear Fig. of this condition is shown in drawing 30 , and it will be connected by an engine 1 and the output shaft 10 through a single pinion mold epicyclic gear device, therefore a carrier 95 is fixed and the 2nd sun gear 96 is made rotated with an engine 1, the output shaft 10 connected with a ring wheel 92 and this carries out inverse rotation, and carries out go-astern transit. In addition, one way clutch F1 connected with the follower pulley 13 since a ring wheel 92 carries out inverse rotation as shown in drawing 30 in this case It is engaged. However, this one way clutch F1 2nd brake B-2 which has a serial relation Since it has released, equipment does

not lock.

[0121] The motor mode in the case of go-astern transit is the 1st brake B1. You make it engaged and it sets up. That is, the epicyclic gear device 90 is operated as a single pinion mold epicyclic gear device by the long pinion gear 94, the carrier 95, and ring wheel 92 which have geared with the 2nd sun gear 96 to this. The carrier 95 is a brake B1. Since it is fixed, if forward rotation of the motor generator 2 is carried out, when the 2nd sun gear 96 connected with this carries out forward rotation, a ring wheel 92 will carry out inverse rotation. Therefore, since an output shaft 10 carries out inverse rotation with the power of a motor generator 2, go-astern transit can be performed. In addition, when the follower pulley 13 rotates in the go-astern transit direction in that case, it is an one way clutch F1. Although engaged, it is 2nd brake B-2. Since it is released, equipment does not lock.

[0122] The engine motor mode in the case of go-astern transit is the 2nd clutch C2. While making it engaged and connecting an engine 1 with the 2nd sun gear 96, it is a brake B1. It sets up by making it engaged and fixing a carrier 95. In the motor mode in the go-astern transit mentioned above, become the mode which inputs the power of an engine 1 into the 2nd sun gear 96 in addition to the power of a motor generator 2, the 2nd sun gear 96 is made to carry out forward rotation with the power of the these engines 1 and motor generator 2 which followed, and a ring wheel 92 is made to carry out inverse rotation of this condition with the torque according to it, consequently an output shaft 10 carries out inverse rotation, and it turns into a go-astern run state. In addition, it is an one way clutch F1 also in this case. It is engaged.

[0123] Thus, making one of friction engagement equipments slip, and maintaining a stop condition, before connecting an engine 1, and starting an engine 1 or starting go-astern transit, after starting go-astern transit with a motor generator 2, since a motor generator 2 and an engine 1 can be connected when carrying out go-astern transit, start an engine 1, friction engagement equipment is made completely engaged after that with a motor generator 2, and go-astern transit is started.

[0124] Also in the hybrid driving gear shown in drawing 26, while being able to operate the epicyclic gear device 90 with a torque converter similarly in the case of advance transit and being able to aim at magnification of an output torque, with the engine 1 operated, rotation of an output shaft 10 can be stopped and it can stop. moreover -- even if it is the case where can carry out go-astern transit with the power of an engine 1, therefore the charge capacity of a dc-battery (not shown) is falling by changing the method of the input from an engine 1 over the epicyclic gear device 90 -- the need -- go-astern transit can be carried out with sufficient driving force. With the hybrid driving gear of a configuration of being shown furthermore in drawing 26, they are each clutch C1 and C2. Since it is for transmitting the power of an engine 1 to sun gears 91 and 96, they are the clutch C1 and C2. The transfer torque capacity demanded does not exceed the torque which an engine 1 outputs, therefore is these C1 and C2. The whole equipment can be miniaturized as a thing of small capacity.

[0125] The example which used the RABINIYO mold epicyclic gear device in which the configuration of a long pinion was changed next is explained. Drawing 31 shows the example and its number of teeth of the long pinion in the RABINIYO mold epicyclic gear device 100 shown here has increased in the part which gears to the 2nd sun gear. That is, this RABINIYO mold epicyclic gear device 100 is equipped with the carrier 105 which held the long pinion gear 104 which gears like what is shown in drawing 26 mentioned above to the Short pinion gear 103 which gears to the 1st sun gear 101, and this Short pinion gear 103 and ring wheel 102 free [ rotation and revolution ], and the 2nd sun gear 106 which got into gear to that long pinion gear 104. [ the 1st sun gear 101, a ring wheel 102, and ] And the outer diameter of the part where the 2nd sun gear 106 has got into gear among the long pinion gears 104 is larger than the outer diameter of the part which has geared with the ring wheel 102, and the number of teeth of this part has increased.

[0126] And the 1st clutch C1 which connects an engine 1 alternatively to the 1st sun gear 101 While being prepared, a motor generator 2 is connected with the 2nd sun gear 106, and it is the 2nd clutch C2 between the 2nd sun gear 106 of a parenthesis, and a carrier 105. It is arranged. The 1st brake B1 which the output shaft 10 is furthermore connected with the carrier 105, and fixes this carrier 105 alternatively 2nd brake B-2 which fixes a ring wheel 102 alternatively It is prepared. Since other configurations are



the same as the configuration shown in drawing 1 , they give the same sign as drawing 1 to drawing 31 , and omit the explanation.

[0127] The transit mode (operation mode) which can be set up with the hybrid driving gear shown in this drawing 31 is as being shown in drawing 32 . First, if engine starting mode is explained, when putting an engine 1 into operation, it is the 1st clutch C1. While making it engaged and connecting an engine 1 with the 1st sun gear 101, it is the 1st brake B1. You make it engaged and a carrier 105 is fixed. The collinear Fig. of this condition is as being shown in drawing 33 . In addition, it is rho 3 in the following collinear Figs. It is the ratio of the number of teeth of the part which has geared to said 1st pinion gear 103 of said 2nd pinion gear 104, and the number of teeth of the part which has geared to said 2nd sun gear 106. If inverse rotation of the 2nd sun gear 106 is carried out with a motor generator 2 where a carrier 105 is fixed, the 1st sun gear 101 which has connected the engine 1 will carry out forward rotation. That is, since an engine 1 is made to carry out forward rotation, an engine 1 can be put into operation by supplying a fuel to an engine 1 in this condition, and lighting if needed.

[0128] In case advance transit is carried out, three transit modes are possible like the equipment shown in drawing 26 mentioned above. First, when the ETC mode as which the epicyclic gear device 100 is similarly operated with a torque converter is explained, it is the 1st clutch C1 in this case. You make it engaged. The collinear Fig. of the condition is shown in drawing 34 . Namely, it will be in the condition that the engine 1 and the motor generator 2 were connected with the 1st sun gear 101 and the 2nd sun gear 106 used as the relation rotated to an opposite direction mutually [ when the carrier 105 of an output shaft 10 and one is fixed ]. Therefore, if an engine 1 is operated in the for example most efficient condition and inverse rotation of the motor generator 2 is carried out at a predetermined engine speed in the condition, as a continuous line shows to drawing 34 , rotation of an output shaft 10 stops, and a stop condition can be maintained, with the engine 1 operated. If the rotational frequency of a motor generator 2 is changed from this condition to a forward hand of cut (i.e., if the rotational frequency of the direction of inverse rotation is decreased and forward rotation is carried out gradually), the torque of a forward hand of cut will arise in an output shaft 10, and that rotational frequency will increase gradually. In that case, the torque of an output shaft 10 turns into torque amplified rather than the output torque of an engine 1. That is, driving torque is made to amplify with the power which a motor generator 2 outputs, driving an engine 1. Therefore, it becomes motor assistant mode.

[0129] The motor mode at the time of advance transit is the 2nd clutch C2. It sets up as a condition which was made engaged and linked the motor generator 2 with the output shaft 10 directly through the carrier 105. Therefore, since the power of a motor generator 2 is transmitted to an output shaft 10 as it is, it can run with the power of a motor generator 2.

[0130] The engine motor mode in the case of advance transit is the 1st clutch C1. The 2nd clutch C2 You make it engaged and it sets up. Namely, the 2nd clutch C2 Since the 2nd sun gear 106 and a carrier 105 are connected by making it engaged, the whole epicyclic gear device 100 is unified. Furthermore, it is the 1st clutch C1. Since it is engaged, and it is unified and the engine 1 is connected with the 1st sun gear 101 of the epicyclic gear device 100, an engine 1 and a motor generator 2 will be in the condition of having been directly linked with the output shaft 10. Therefore, the power of an engine 1 and a motor generator 2 can be transmitted to an output shaft 10 as it is, and advance transit can be carried out.

[0131] Also when carrying out go-astern transit, three transit modes (operation mode) are possible. First, if engine mode is explained, when the power of an engine 1 will perform go-astern transit, it is the 1st clutch C1. 2nd brake B-2 You make it engaged. That is, while connecting an engine 1 with the 1st sun gear 101, a ring wheel 102 is fixed. If forward rotation of the 1st sun gear 101 is carried out with an engine 1 where the collinear Fig. of this condition is shown in drawing 35 and a ring wheel 102 is fixed, the output shaft 10 connected with a carrier 105 and this can carry out inverse rotation, therefore go-astern transit can be carried out with the power of an engine 1.

[0132] The motor mode in the case of go-astern transit is 2nd brake B-2. You make it engaged and it sets up. In this mode, since power is inputted only into the 2nd sun gear 106 from a motor generator 2 and the ring wheel 102 is being fixed in that condition, the output shaft 10 connected with a carrier 105 and this carries out inverse rotation. In that case, ratio rho 2 of the number of teeth of the 2nd sun gear

106 and a ring wheel 102 (namely, gear ratio) Since it responds and the rotational frequency of a carrier 105 is decreased, the output torque produced in an output shaft 10 is increased according to the gear ratio, therefore the change gear ratio at the time of go-astern with motor mode can be set as a large value.

[0133] The engine motor mode which carries out go-astern transit with an engine 1 and a motor generator 2 is the 1st clutch C1. 2nd brake B-2 You make it engaged and it sets up. That is, while connecting an engine 1 with the 1st sun gear 101, a ring wheel 102 is fixed. In this condition, since a carrier 105 will carry out inverse rotation if the torque of the direction of inverse rotation acts on a carrier 105 and the power of a forward hand of cut is inputted into the 2nd sun gear 106 like this with the power inputted into the 1st sun gear 101, the power of an engine 1 and a motor generator 2 can be compounded according to the epicyclic gear device 100, and it can transmit to an output shaft 10. That is, with the power of an engine 1 and a motor generator 2, inverse rotation of the output shaft 10 can be carried out, and go-astern transit can be carried out.

[0134] yes it is indicated to drawing 31 that mentioned above -- while the function as the so-called torque converter which is made to amplify the output torque of an engine 1 and is outputted to an output shaft 10 also in a Brit driving gear can be attained, even if it is the case where can carry out go-astern transit with an engine 1, therefore the charge capacity of a dc-battery (not shown) is falling -- the need -- it is possible to carry out go-astern transit with sufficient driving force.

[0135] Furthermore, it also sets to the hybrid driving gear of a configuration of being shown in this drawing 31 , and they are each clutch C1 and C2. It is arranged so that the power which an engine 1 or a motor generator 2 outputs may be transmitted, and since the torque amplified by the gearing device etc. is not transmitted, that transfer torque capacity may be small, consequently can form the whole equipment into small lightweight.

[0136] Although each example explained above is an example which used 1 set of epicyclic gear devices, with the equipment of this invention, two or more sets of epicyclic gear devices can be used. Hereafter, the example is explained.

[0137] The hybrid driving gear shown in drawing 36 is the example which used 2 sets of single pinion mold epicyclic gear devices 110,111 which connected two rotation elements of each other, and these epicyclic gear devices 110,111 use as a rotation element the ring wheel 114,115 arranged on a concentric circle to a sun gear 112,113 and a sun gear 112,113, respectively, and the carrier 116,117 which held the pinion gear which geared to the sun gear 112,113 and the ring wheel 114,115 free [ rotation and revolution ]. And the carrier 116 of the 1st epicyclic gear device 110 and the ring wheel 115 of the 2nd epicyclic gear device 111 are connected in one, and the ring wheel 114 of the 1st epicyclic gear device 110 and the carrier 117 of the 2nd epicyclic gear device 111 are connected in one.

[0138] The 1st one way clutch F1 engaged between this sun gear 113 and the sun gear 112 of the 1st epicyclic gear device 110 in case torque is transmitted to the 1st epicyclic gear device 110 side from the 2nd epicyclic gear device 111 side in a forward hand of cut while a motor generator 2 is connected with the sun gear 112 of that 2nd epicyclic gear device 111 The 1st clutch C1 of a multi-plate type It is arranged at the serial. Moreover, an engine 1 and the 1st clutch C1 The 2nd one way clutch F2 which engages with it when transmitting torque from an engine 1 in between It is arranged. Therefore, in the sun gear 112 of an engine 1 to the 1st epicyclic gear device, it is the 2nd one way clutch F2. The 1st clutch C1 It minds and torque is transmitted. Furthermore between an engine 1 and the sun gear 113 of the 2nd epicyclic gear device 111, it is the 2nd clutch C2 of a multi-plate type. It is arranged.

[0139] The 1st brake B1 which fixes alternatively the ring wheel 114 of the 1st epicyclic gear device 110 and the carrier 117 of the 2nd epicyclic gear device 111 which are connected It is prepared. Moreover, the carrier 116 of the 1st epicyclic gear device 110 is connected with the output shaft 10.

[0140] Moreover, between the follower pulleys 13 and casing 9, it is the 3rd one way clutch F3. 2nd brake B-2 of a multi-plate type It is arranged at the sequence. [ in / on the other hand / a change gear 11 ] This one way clutch F3 It is constituted so that it may be engaged, when torque is received in the direction which carries out \*\*\*\*\* go-astern transit when the follower pulley 13 tends to carry out inverse rotation. Furthermore, the 3rd clutch C3 which connects both alternatively between these

follower pulley 13 and counter gear 15 It is prepared.

[0141] In addition, along with the medial-axis line of a driving pulley 12, pumping axes 118 penetrate and are arranged. One edge of these pumping axes 118 is connected so that it may really rotate on the shaft connected with the engine 1 or the engine 1, and the other-end section minds the chain device 119, and it is an oil pump Op. It is connected. In addition, a sign 120 shows a drive plate and 121 shows a damper device, respectively.

[0142] Various kinds of transit modes (operation mode) can be set up like each example mentioned above also in the hybrid driving gear shown in drawing 36 mentioned above. That is, at the starting mode which puts an engine 1 into operation in the condition that the car has stopped, it is the 2nd clutch C2. You make it engaged. The 2nd clutch C2 Since an engine 1 is connected with the sun gear 113 of the 2nd epicyclic gear device 111 and the motor generator 2 is always connected with this sun gear 113 by being engaged, a motor generator 2 and an engine 1 will be in a direct connection condition. Therefore, if a motor generator 2 is driven to a forward hand of cut, an engine 1 can be put into operation by rotating an engine 1, and supplying a fuel in the condition, and lighting if needed.

[0143] Moreover, the ETC mode which can amplify the output torque of an engine 1 with a motor generator 2 at the time of advance transit, and can be outputted to an output shaft 10 is the 1st clutch C1. And the 3rd clutch C3 You make it engaged and it sets up. That is, when the carrier 116 of the 1st epicyclic gear device 110 connected with the output shaft 10 and the ring wheel 115 of the 2nd epicyclic gear device 111 are fixed, it becomes the relation which the sun gear 112 of the 1st epicyclic gear device 110 and the sun gear 113 of the 2nd epicyclic gear device 111 rotate to an opposite direction mutually, and an engine 1 and a motor generator 2 will be connected with these rotation element mutually rotated to an opposite direction.

[0144] The collinear Fig. has shown this condition to drawing 37 . That is, if an engine 1 is operated in the for example most efficient condition and inverse rotation of the motor generator 2 is carried out at a predetermined rotational frequency in the condition, as a continuous line shows to drawing 37 , rotation of an output shaft 10 can stop and a stop condition can be maintained. If the torque of the forward hand of cut of a motor generator 2 is increased from this condition, that rotational frequency will increase (the rotational frequency of the direction of inverse rotation decreasing), and the output shaft 10 connected with the carrier 116 of the 1st epicyclic gear device 110 which is an output element, the ring wheel 115 of the 2nd epicyclic gear device 111, and these in connection with it will carry out forward rotation, as a broken line shows to drawing 37 . And the torque produced in the output shaft 10 becomes larger than the output torque of an engine 1. Therefore, a magnification operation of torque arises like a torque converter. In addition, transfer of the torque from an engine 1 to the 1st sun gear 112 is an one way clutch F2. Since it is carried out by minding, in a power-off condition, it is this one way clutch F1. It releases. Therefore, an engine 1 can be suspended in the state of power-off.

[0145] Since it is the mode which makes a motor generator 2 the so-called condition of having linked directly at an output shaft 10, the motor mode at the time of advance transit is each 1st thru/or 3rd clutch C1, C2, and C3. You make it engaged. the 2nd clutch C2 you make it engaged -- the 2nd one way clutch F2 \*\*\*\* -- since the torque of a forward hand of cut will input from an engine 1 side -- this one way clutch F1 It is engaged. Moreover, this 2nd one way clutch F2 The 1st clutch C1 which has a serial relation By being engaged, the 1st one way clutch F2 is the 1st clutch C1. It minds and connects with the sun gear 112 of the 1st epicyclic gear device 110. Consequently, a motor generator 2 is connected with the sun gear 112 of the 1st epicyclic gear device 110. Moreover, since this motor generator 2 is always connected with the sun gear 113 of the 2nd epicyclic gear device 111, each sun gear 112,113 will be connected in one after all. Therefore, the 1st epicyclic gear device 110 and the whole 2nd epicyclic gear device 111 are unified, and the power of a motor generator 2 is transmitted to an output shaft 10 as it is, and can carry out advance transit with the power of a motor generator 2.

[0146] In addition, it is the 2nd one way clutch F2 in this case. The 1st clutch C1 An engine 1 is connected with the sun gear 112 of the 1st epicyclic gear device 110, and is made to rotate with the power of a motor generator 2 by being engaged. It will be in the condition of dragging the so-called engine 1. Therefore, it is desirable to reduce the resistance accompanying making an engine 1 race by

the thing of making the throttle valve (not shown) of an engine 1 full open, or opening both an intake valve and an exhaust air bulb as much as possible. Moreover, since it continues making an engine 1 rotated during transit, starting of the engine 1 under transit becomes easy.

[0147] As mentioned above, they are each 1st thru/or 3rd clutch C1, C2, and C3. If you make it engaged, since an engine 1 and a motor generator 2 will be in the condition of having been directly linked to the output shaft 10, if it outputs not only from the motor generator 2 but from the engine 1, advance transit can be carried out with the power of an engine 1 and a motor generator 2. That is, it becomes engine motor mode.

[0148] When the mode at the time of go-astern transit is explained below, the engine mode which carries out go-astern transit with the power of an engine 1 is the 2nd clutch C2. The 3rd clutch C3 The 1st brake B1 You make it engaged. That is, while connecting an engine 1 with the sun gear 113 of the 2nd epicyclic gear device 111, the carrier 117 is fixed. Therefore, the output shaft 10 connected with a ring wheel 115 and this if forward rotation of the sun gear 113 is carried out with an engine 1 carries out inverse rotation, and the power is a change gear 11 and the 3rd clutch C3. It minds, and it is outputted and will be in a go-astern condition. This condition is shown in drawing 38 as a collinear Fig.

[0149] Moreover, since the motor generator 2 is always connected with the sun gear 113 of the 2nd epicyclic gear device 111 in this case, if it outputs not only from the engine 1 but from the motor generator 2, since the power of an engine 1 and a motor generator 2 will be transmitted to an output shaft 10, it becomes the engine motor mode in go-astern transit.

[0150] Furthermore, the 1st brake B1 If you make it engaged and the torque of a forward hand of cut is inputted into the sun gear 113 of the 2nd epicyclic gear device 111, since the output shaft 10 connected with a ring wheel 115 and this will carry out inverse rotation and will be in a go-astern run state The 2nd clutch C2 If it releases, an engine 1 is intercepted from the sun gear 113 of the 2nd epicyclic gear device 111 and a motor generator 2 is driven to a forward hand of cut in the condition, go-astern transit can be carried out with the power of a motor generator 2. That is, it becomes the motor mode at the time of go-astern transit.

[0151] As mentioned above, the 1st brake B1 If forward rotation of the sun gear 113 is carried out where the carrier 117 of the 2nd epicyclic gear device 111 is fixed, since the ring wheel 115 connected with the output shaft 10 will carry out inverse rotation, if forward rotation of the ring wheel 115 is carried out contrary to this, a sun gear 113 will carry out inverse rotation. Regenerative braking at the time of advance transit can be performed using this. For example, by the braking demand at the time of carrying out advance transit in the ETC mode mentioned above, it is the 1st clutch C1. It changes and is the 1st brake B1. If you make it engaged, as the collinear Fig. is shown in drawing 39, where the carrier 117 of the 2nd epicyclic gear device 111 is fixed, the ring wheel 115 will carry out forward rotation by the torque inputted from an output shaft 10, consequently a sun gear 113 will carry out inverse rotation. Since the torque which acts on this sun gear 113 is transmitted to a motor generator 2 and a motor generator 2 is made to carry out inverse rotation compulsorily, electromotive force arises with a motor generator 2. That is, since the power inputted from an output shaft 10 is changed into electrical energy and consumed, the drag force in that case acts as damping force.

[0152] Moreover, a leech hold mode can be set up in the hybrid driving gear shown in above-mentioned drawing 36. A leech hold mode is 2nd brake B-2 which is the mode held so that a car may not retreat at the time of start on a climb way, and this mentioned above. And it is attained by this and the 3rd serial one way clutch. Namely, the 3rd one way clutch F3 Since it is engaged in case the follower pulley 13 tends to rotate in the go-astern transit direction, it is 2nd brake B-2. And the 3rd clutch C3 If it stops on a climb way in the condition that you made it engaged and a braking operation is canceled, the load which carries out retreat migration with the self-weight will act on a car. That is, since the torque to which inverse rotation of this is carried out acts on the follower pulley 13, it is the 3rd one way clutch F3. It is engaged and the rotation is prevented. That is, in case it departs on a climb way, even if it cancels braking actuation and performs start actuation, retreat migration of a car is prevented, and smooth start from a idle state can be performed.

[0153] Thus, even if it is the hybrid driving gear of a configuration of being shown in drawing 36, while

being able to perform smoothly transit which needs the large driving force at the time of start etc. by amplifying and outputting an engine torque at the time of advance transit, go-astern transit can be carried out with the power of an engine 1. Moreover, even if it is the configuration shown in drawing 36, it is the 1st clutch C1. And the 2nd clutch C2 Since the output torque of an engine 1 is transmitted as it is, especially the transfer torque capacity does not need to be large, therefore they are these clutches C1 and C2. It can miniaturize and a hybrid driving gear can be formed into small lightweight as a whole.

[0154] Other examples which used 2 sets of epicyclic gear devices are explained below. Like the example shown in drawing 36 mentioned above, 2 sets of single pinion mold epicyclic gear devices are used for the example shown in drawing 40, and it changes the connection condition of the rotation element, and the connection condition of an engine 1 or friction engagement equipment with the configuration of drawing 36. That is, the carrier 116 of the 1st epicyclic gear device 110 is connected with the ring wheel 115 of the 2nd epicyclic gear device 111 in one, and the sun gear 112 of the 1st epicyclic gear device 110 is connected with the carrier 117 of the 2nd epicyclic gear device 111 in one.

[0155] Moreover, it is the 1st clutch C1 between the ring wheel 114 of the 1st epicyclic gear device 110, and an engine 1. It is arranged and is the 2nd clutch C2 between the sun gear 113 of the 2nd epicyclic gear device 111, and an engine 1. It is arranged. Furthermore, it is the 1st brake B1 so that rotation of the sun gear 112 of the 1st epicyclic gear device 110 may be fixed alternatively. It is arranged. Since other configurations are the same as the configuration shown in drawing 36, they give the same sign as drawing 36 to drawing 40, and omit the explanation.

[0156] When the transit mode (operation mode) which can be set up with this hybrid driving gear is explained, engine starting mode is the 1st clutch C1. 2nd brake B-2 You make it engaged and it sets up. The collinear Fig. of this condition is shown in drawing 41. When 2nd brake B-2 is made engaged, the inverse rotation of the follower pulley 13 10, i.e., an output shaft, is the 3rd one way clutch F3. It is prevented. Therefore, since the carrier 116 of an output shaft 10 and the 1st epicyclic gear device 110 of one is fixed when inverse rotation of the motor generator 2 is carried out and the torque of the direction of inverse rotation is given to the sun gear 112 of the 1st epicyclic gear device 110, a ring wheel 114 carries out forward rotation. Since the engine 1 is connected with this ring wheel 114, an engine 1 can be put into operation by making an engine 1 carry out forward rotation with the power of a motor generator 2, and supplying a fuel in that condition after all, and lighting if needed.

[0157] In that case, the carrier 116 of the 1st epicyclic gear device 110 used as a fixed element is said 3rd one way clutch F3. It is possible to be held so that inverse rotation may not be carried out, and to carry out forward rotation. Therefore, if an engine 1 is operated in the for example most efficient condition and the output torque of the forward hand of cut of a motor generator 2 is gradually increased in the condition after putting an engine 1 into operation, a carrier 116 and the output shaft 10 of this and one will begin to carry out forward rotation. Namely, the 3rd one way clutch F3 Engagement is canceled. And the driving torque in that case turns into torque which amplified the output torque of an engine 1 with the motor generator 2. This is the 1st clutch C1 with the hybrid driving gear of a configuration of being the same as that of the magnification function of the torque by the torque converter, therefore being shown in drawing 40. And the 3rd clutch C3 The so-called ETC mode can be set up by making it engaged. In other words, this mode is the mode which connects an engine 1 and a motor generator 2 with two rotation elements used as the relation mutually rotated to an opposite direction, and is set as them, when an output shaft 10 and the rotation element of one are fixed.

[0158] Thus, when starting a car, it is 2nd brake B-2. And the 3rd one way clutch F3 Since it is engaged and retreat migration of a car is prevented, the leech hold facility mentioned above can be obtained.

[0159] Below, the motor mode at the time of advanced transit is explained. This motor mode is the mode links a motor generator 2 with an output shaft 10 directly, and it runs under the power of a motor generator 2, therefore is the 1st thru/or the 3rd clutch C1, C2, and C3. You make it engaged. The 1st and 2nd clutches C1 and C2 If you make it engaged, since the ring wheel 114 of the 1st epicyclic gear device 110 and the sun gear 113 of the 2nd epicyclic gear device 111 will be connected in one, each whole epicyclic gear device 110,111 is unified. Therefore, a motor generator 2 is directly linked with an output

shaft 10, and the power of a motor generator 2 is outputted as it is. In that case, since an engine 1 is also directly linked with an output shaft 10 through the epicyclic gear device 110,111, an engine 1 is made raced. Thus, in order to prevent loss of the power for making an engine 1 race, it is desirable to establish the proper clutch device for separating from the epicyclic gear device 110,111 in which the engine 1 was unified. Moreover, if an engine 1 is made to race, operation of auxiliary machinery, such as starting of the engine 1 of a under [ transit ] and an air-conditioner, becomes easy.

[0160] In motor mode, since an engine 1 is also directly linked with an output shaft 10 as mentioned above, if not only the motor generator 2 but the engine 1 is driven, advance transit can be carried out with the power of an engine 1 and a motor generator 2. That is, it becomes engine motor mode.

[0161] Also in the configuration shown in above-mentioned drawing 40, go-astern transit can be carried out with the output of an engine 1. This engine mode is the 2nd clutch C2. The 3rd clutch C3 The 1st brake B1 You make it engaged and it sets up. This condition is shown in drawing 42 as a collinear Fig. The 1st brake B1 Where the sun gear 112 of the 1st epicyclic gear device 110 and the carrier 117 of the 2nd epicyclic gear device 111 are fixed, it is an engine 1 to the 2nd clutch C2. If it minds and the torque of a forward hand of cut is transmitted to the sun gear 113 of the 2nd epicyclic gear device 111, the output shaft 10 connected with the ring wheel 115 and this will carry out inverse rotation, and the power of an engine 1 will be outputted as power of the direction of inverse rotation. That is, go-astern transit is carried out.

[0162] It is the 1st brake B1 about the reaction force for go-astern transit in this mode. Although given, it is the 1st brake B1. Since the motor generator 2 is connected with the sun gear 112 of the 1st epicyclic gear device 110 connected, reaction force can be given with a motor generator 2. If reaction force by the motor generator 2 is gradually made small when it does in this way, the carrier 117 of the sun gear 112 of the 1st epicyclic gear device 110 and the 2nd epicyclic gear device 111 of this and one will begin to carry out forward rotation gradually, and the rotational frequency of a ring wheel 115 and the output shaft 10 of this and one will fall to this and coincidence. and -- just -- being alike -- rotation of an output shaft 10 stops. Moreover, if the reaction force (torque of the direction of inverse rotation) by the motor generator 2 is increased contrary to this, the rotational frequency of the direction of inverse rotation of an output shaft 10 will increase. That is, the driving torque for go-astern transit can be controlled by the output of a motor generator 2, and, moreover, the driving torque turns into torque which amplified the engine torque with the motor generator 2. Like the ETC mode at the time of advance transit, this is the magnification function of torque and can set up ETC mode with the configuration shown in drawing 40 also at the time of go-astern transit.

[0163] In addition, when the proper clutch means which separates an engine 1 from the unified epicyclic gear device 110,111 is established in the motor mode which linked the motor generator 2 with the output shaft 10 directly as mentioned above although motor mode for go-astern transit cannot be set up with a configuration of being shown in drawing 40 since an engine 1 is also directly linked with an output shaft 10 as mentioned above, go-astern transit can be carried out only with the power of a motor generator 2.

[0164] Thus, also in the hybrid driving gear of a configuration of being shown in drawing 40, since go-astern transit can be carried out with the power of an engine 1 while being able to obtain the function as a torque converter which amplifies and outputs an engine torque, even if it is the case where the charge capacity of a dc-battery (not shown) is falling, sufficient driving force for go-astern transit can be obtained. moreover, clutch C1 which adjoins the epicyclic gear device 110,111 and is arranged C2 \*\*\*\* -- since it is transmitted while the output torque of an engine 1 has not been amplified -- these clutches C1 and C2 the transfer torque capacity demanded is small, therefore attains small lightweight-ization of equipment -- things can be carried out. Since a motor generator 2 can be adjoined and the epicyclic gear device 110,111 can be arranged as furthermore shown in drawing 40, by considering as such a configuration, it can become possible to make a part of epicyclic gear device 110,111 enter into the inner circumference side of Rota of a motor generator 2, consequently axial length as the whole equipment can be shortened, and small lightweight-ization can be attained.

[0165] When the relation between this invention and each example mentioned above is explained here, the example shown in drawing 1 and drawing 6 thru/or drawing 8 is an example of invention of claim 1



and claim 2, and the example shown in drawing 9 is an example of invention of claim 1 and claim 3. The example furthermore shown in drawing 15 is an example of invention of claim 5 and claim 6, and the example shown in drawing 20 is an example of invention of claim 1 and claim 4. The examples shown in drawing 26 are claim 7 thru/or an example of invention of nine, and the example shown in drawing 31 is an example of invention of claim 7 and the claim warehouse 10. The example shown in drawing 36 is an example of invention of claim 11, claim 12, and claim 14. And the example shown in drawing 40 is an example of invention of claim 11, claim 13, and claim 14.

[0166] In addition, by the above-mentioned example, although the belt-type nonstep variable speed gear was shown as a change gear, in this invention, it may change to this, and a toroidal-type nonstep variable speed gear may be used, and the change gear of an owner stage type may be used. Furthermore, the thing of proper configurations, such as a belt type and an engagement type, can be used for a clutch means or a brake means in addition to the friction engagement equipment of a wet multi-plate type.

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[Translation done.]

**\* NOTICES \***

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- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1] It is the skeleton Fig. showing an example of this invention.

[Drawing 2] It is the graph showing engagement / release condition of the friction engagement equipment for setting up each operation mode with the hybrid driving gear of a configuration of being shown in drawing 1 .

[Drawing 3] It is a collinear Fig. for explaining the rotation condition of each rotation element in the engine starting mode by the hybrid driving gear of a configuration of being shown in drawing 1 .

[Drawing 4] It is a collinear Fig. for explaining the rotation condition of each rotation element in the ETC mode by the hybrid driving gear of a configuration of being shown in drawing 1 .

[Drawing 5] It is a collinear Fig. for explaining the rotation condition of each rotation element in the engine mode at the time of the go-astern transit by the hybrid driving gear of a configuration of being shown in drawing 1 .

[Drawing 6] It is the fragmentary sectional view showing the example which materialized the hybrid driving gear of a configuration of being shown in drawing 1 .

[Drawing 7] It is the fragmentary sectional view showing other parts of the example which materialized the hybrid driving gear of a configuration of being shown in drawing 1 .

[Drawing 8] It is the fragmentary sectional view showing the part of further others of the example which materialized the hybrid driving gear of a configuration of being shown in drawing 1 .

[Drawing 9] It is the skeleton Fig. showing other examples of this invention.

[Drawing 10] It is the graph showing engagement / release condition of the friction engagement equipment for setting up each operation mode with the hybrid driving gear of a configuration of being shown in drawing 9 .

[Drawing 11] It is a collinear Fig. for explaining the rotation condition of each rotation element in the engine starting mode by the hybrid driving gear of a configuration of being shown in drawing 9 .

[Drawing 12] It is a collinear Fig. for explaining the rotation condition of each rotation element in the ETC mode by the hybrid driving gear of a configuration of being shown in drawing 9 .

[Drawing 13] It is a collinear Fig. for explaining the rotation condition of each rotation element in the engine mode at the time of the go-astern transit by the hybrid driving gear of a configuration of being shown in drawing 9 .

[Drawing 14] It is the skeleton Fig. showing the configuration which added the oil pump in the hybrid driving gear of a configuration of being shown in drawing 9 .

[Drawing 15] It is the skeleton Fig. showing the example of further others of this invention.

[Drawing 16] It is the graph showing engagement / release condition of the friction engagement equipment for setting up each operation mode with the hybrid driving gear of a configuration of being shown in drawing 15 .

[Drawing 17] It is a collinear Fig. for explaining the rotation condition of each rotation element in the engine starting mode by the hybrid driving gear of a configuration of being shown in drawing 15 .

[Drawing 18] It is a collinear Fig. for explaining the rotation condition of each rotation element in the

ETC mode by the hybrid driving gear of a configuration of being shown in drawing 15 .

[Drawing 19] It is a collinear Fig. for explaining the rotation condition of each rotation element in the engine mode at the time of the go-ahead transit by the hybrid driving gear of a configuration of being shown in drawing 15 .

[Drawing 20] It is the skeleton Fig. showing the example of further others of this invention.

[Drawing 21] It is the graph showing engagement / release condition of the friction engagement equipment for setting up each operation mode with the hybrid driving gear of a configuration of being shown in drawing 20 .

[Drawing 22] It is a collinear Fig. for explaining the rotation condition of each rotation element in the engine starting mode by the hybrid driving gear of a configuration of being shown in drawing 20 .

[Drawing 23] It is a collinear Fig. for explaining the rotation condition of each rotation element in the ETC mode by the hybrid driving gear of a configuration of being shown in drawing 20 .

[Drawing 24] It is a collinear Fig. for explaining the rotation condition of each rotation element in the engine mode at the time of the go-ahead transit by the hybrid driving gear of a configuration of being shown in drawing 20 .

[Drawing 25] It is the skeleton Fig. showing the configuration which added the oil pump in the hybrid driving gear of a configuration of being shown in drawing 20 .

[Drawing 26] It is the skeleton Fig. showing the example of further others of this invention.

[Drawing 27] It is the graph showing engagement / release condition of the friction engagement equipment for setting up each operation mode with the hybrid driving gear of a configuration of being shown in drawing 26 .

[Drawing 28] It is a collinear Fig. for explaining the rotation condition of each rotation element in the engine starting mode by the hybrid driving gear of a configuration of being shown in drawing 26 .

[Drawing 29] It is a collinear Fig. for explaining the rotation condition of each rotation element in the ETC mode by the hybrid driving gear of a configuration of being shown in drawing 26 .

[Drawing 30] It is a collinear Fig. for explaining the rotation condition of each rotation element in the engine mode at the time of the go-ahead transit by the hybrid driving gear of a configuration of being shown in drawing 26 .

[Drawing 31] It is the skeleton Fig. showing the example of further others of this invention.

[Drawing 32] It is the graph showing engagement / release condition of the friction engagement equipment for setting up each operation mode with the hybrid driving gear of a configuration of being shown in drawing 31 .

[Drawing 33] It is a collinear Fig. for explaining the rotation condition of each rotation element in the engine starting mode by the hybrid driving gear of a configuration of being shown in drawing 31 .

[Drawing 34] It is a collinear Fig. for explaining the rotation condition of each rotation element in the ETC mode by the hybrid driving gear of a configuration of being shown in drawing 31 .

[Drawing 35] It is a collinear Fig. for explaining the rotation condition of each rotation element in the engine mode at the time of the go-ahead transit by the hybrid driving gear of a configuration of being shown in drawing 31 .

[Drawing 36] It is the skeleton Fig. showing the example of further others of this invention.

[Drawing 37] It is a collinear Fig. for explaining the rotation condition of each rotation element in the ETC mode by the hybrid driving gear of a configuration of being shown in drawing 36 .

[Drawing 38] It is a collinear Fig. for explaining the rotation condition of each rotation element in the engine mode at the time of the go-ahead transit by the hybrid driving gear of a configuration of being shown in drawing 36 .

[Drawing 39] It is a collinear Fig. for explaining the rotation condition of each rotation element at the time of regenerative braking by the hybrid driving gear of a configuration of being shown in drawing 36 .

[Drawing 40] It is the skeleton Fig. showing the example of further others of this invention.

[Drawing 41] It is a collinear Fig. for explaining the rotation condition of each rotation element in the ETC mode by the hybrid driving gear of a configuration of being shown in drawing 40 .

[Drawing 42] It is a collinear Fig. for explaining the rotation condition of each rotation element in the engine mode at the time of the go-astern transit by the hybrid driving gear of a configuration of being shown in drawing 40 .

[Description of Notations]

1 -- Internal combustion engine (engine) 2 -- Motor (motor generator), 3 -- Double pinion mold epicyclic gear device 4 -- Sun gear 5 -- Ring wheel, 6 -- The 1st pinion gear 7 -- The 2nd pinion gear 8 -- Carrier, 9 -- Casing B1 -- brake 10 -- Output shaft C1 -- The 1st clutch, C2 -- The 2nd clutch 11 -- Change gear 28 -- Motor generator, 38 -- Epicyclic gear device 39 -- Sun gear 40 -- Carrier, 42 -- Ring wheel 50 -- Output shaft 54 -- A change gear and 80 -- Single pinion mold epicyclic gear device, 81 -- Sun gear 82 -- Ring wheel 83 -- Pinion gear, 84 -- Carrier 90 -- RABINIYO mold epicyclic gear device 91 -- The 1st sun gear, 92 -- Ring wheel 93 -- Short pinion gear 94 -- Long pinion gear, [ 100 -- RABINIYO mold epicyclic gear device, ] 95 -- A carrier, 96 -- The 2nd sun gear 101 -- The 1st sun gear 102 -- Ring wheel 103 -- Short pinion gear, 104 -- Long pinion gear 105 -- Carrier 106 -- The 2nd sun gear 110,111 -- Single pinion mold epicyclic gear device 112,113 [ 116,117 -- Carrier. ] -- A sun gear, 114,115 -- Ring wheel

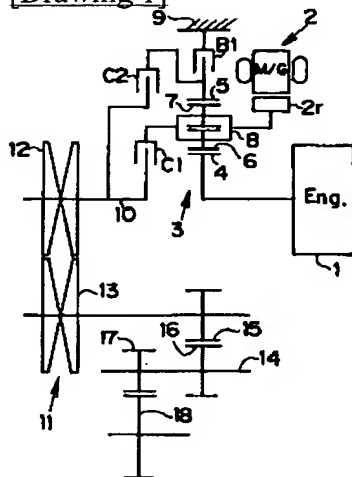
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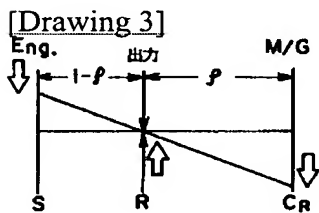
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- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

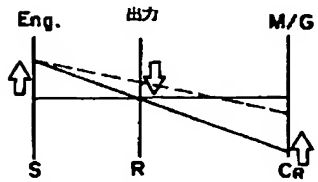
[Drawing 1]



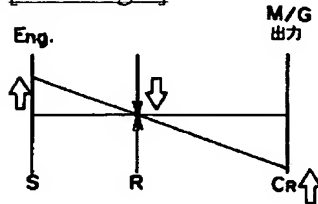
		C1	C2	B1
Eng. 始動		×	○	○
前進	ETC	×	○	×
	モータ	○	×	×
	Eng. (+モータ)	○	○	×
Rev.	Eng.	○	×	○
	モータ	○	×	×
	Eng.+モータ	○	×	○



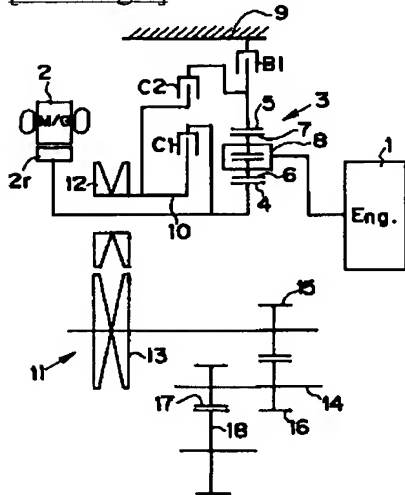
[Drawing 4]



[Drawing 5]

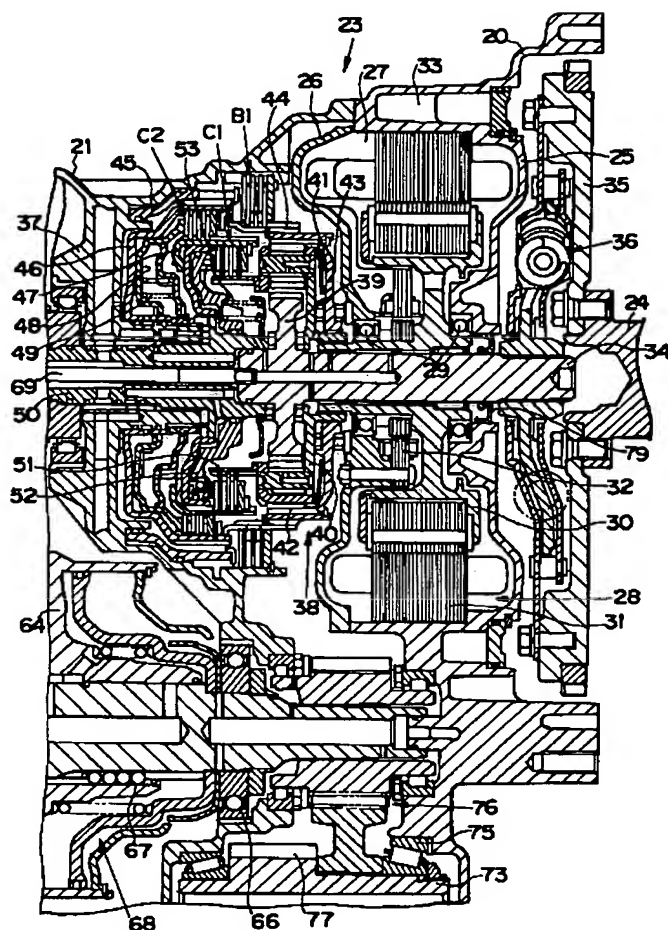


[Drawing 9]

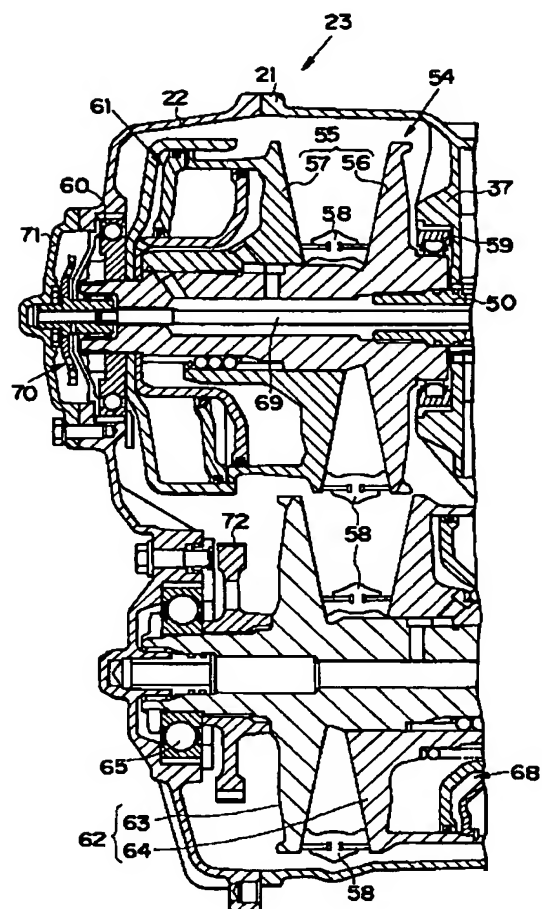


[Drawing 6]





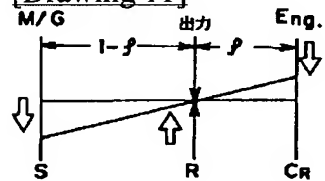
[Drawing 7]



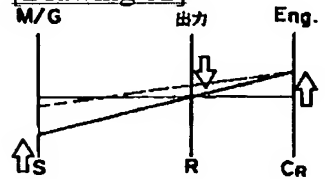
[Drawing 10]

		C1	C2	B1
Eng. 始動		×	○	○
前進	ETC	×	○	×
	モータ	○	○	×
	Eng.(+モータ)	○	○	×
Rev.	Eng.	○	×	○
	モータ	○	○	×
	Eng.+モータ	○	×	○

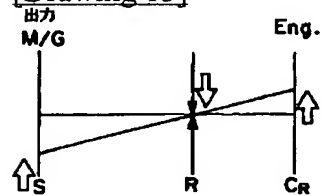
[Drawing 11]



[Drawing 12]



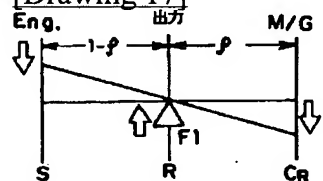
[Drawing 13]



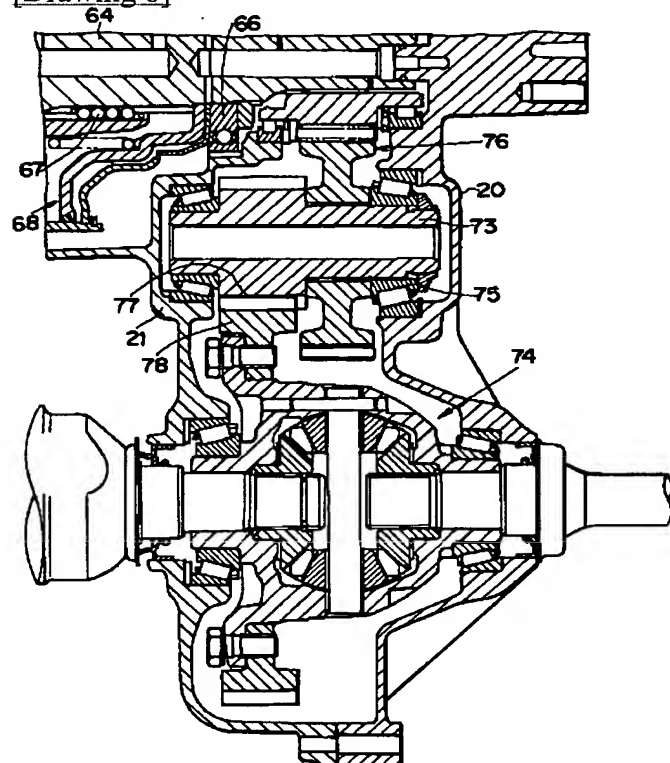
[Drawing 16]

	C1	C2	C3	C4	F1
Eng. 始動	×	○	×	○	○
前進 ETC	×	○	×	○	×
モータ	×	○	○	×	×
Eng. (+モータ)	○	○	○	×	×
Rev. Eng.	○	×	○	×	×
モータ	×	○	○	×	×

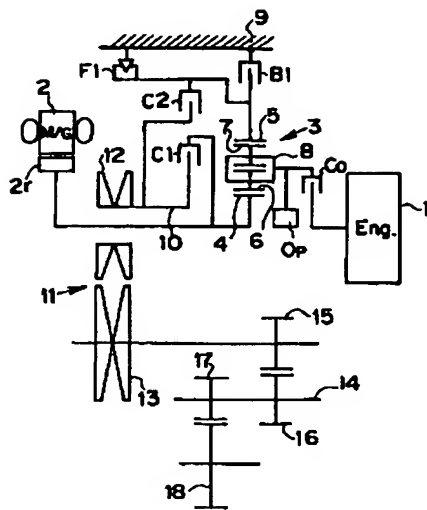
[Drawing 17]



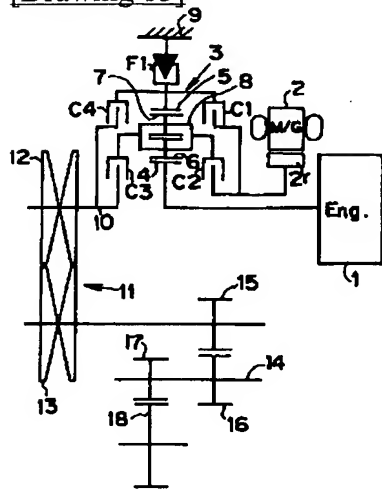
[Drawing 8]



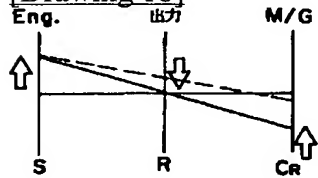
[Drawing 14]



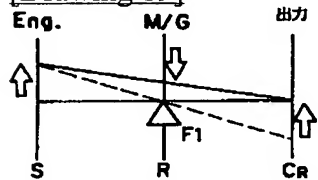
[Drawing 15]



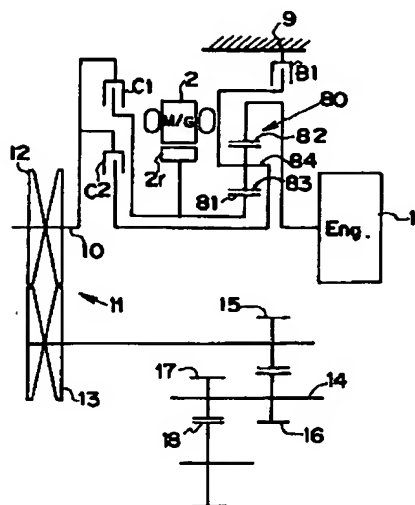
[Drawing 18]



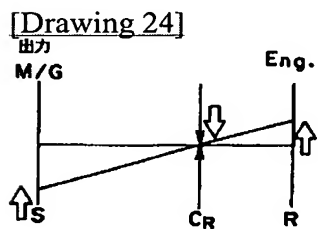
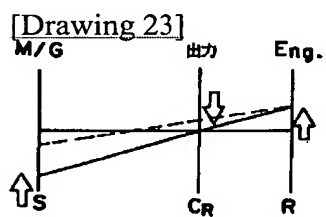
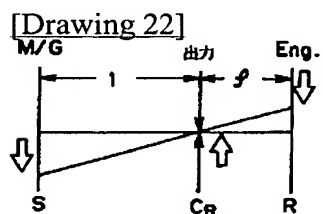
[Drawing 19]



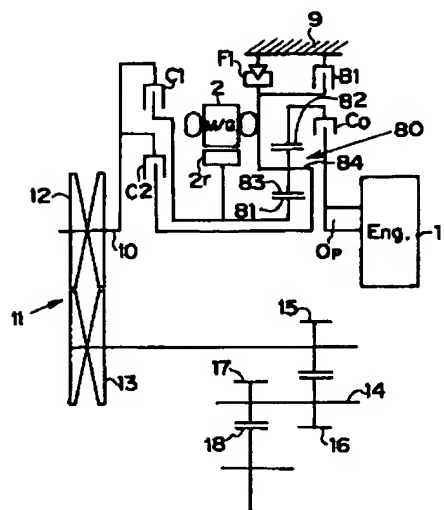
[Drawing 20]



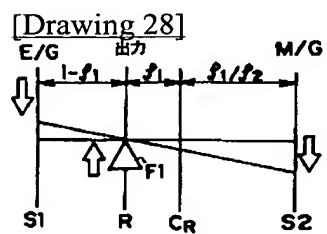
		C1	C2	B1
Eng. 始動		×	○	○
前進	ETC	×	○	×
	モータ	○	×	×
	Eng. (+モータ)	○	○	×
Rev.	Eng.	○	×	○
	モータ	○	×	×
	Eng.+モータ	○	×	○



[Drawing 25]

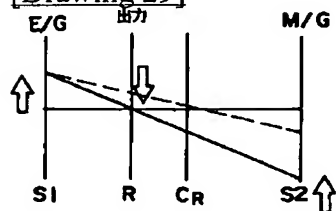


		C1	C2	B1	B2	F1
Eng. 始動		○	×	×	○	○
前進	ETC	○	×	×	×	×
	モータ	×	×	○	○	×
	Eng.(+モータ)	○	○	×	×	×
Rev.	Eng.	×	○	○	×	○
	モータ	×	×	○	×	○
	Eng.+モータ	×	○	○	×	○

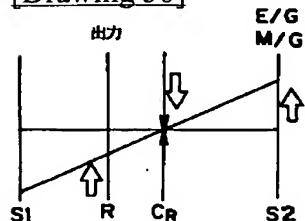




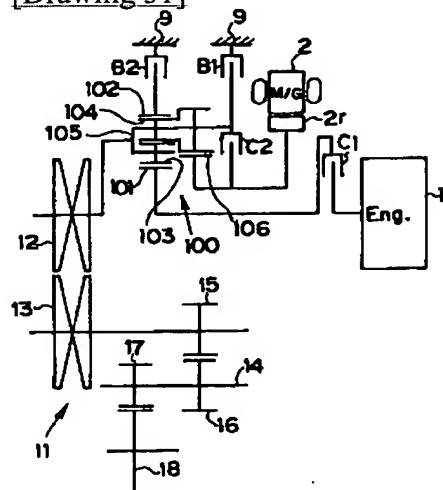
[Drawing 29]



[Drawing 30]



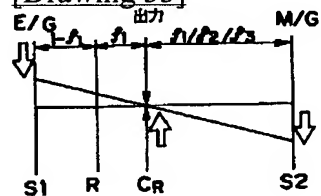
[Drawing 31]



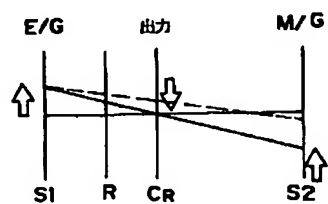
[Drawing 32]

		C1	C2	B1	B2
前進	Eng. 始動	○	×	○	×
	ETC	○	×	×	×
	モータ	×	○	×	×
	Eng. (+モータ)	○	○	×	×
Rev.	Eng.	○	×	×	○
	モータ	×	×	×	○
	Eng. + モータ	○	×	×	○

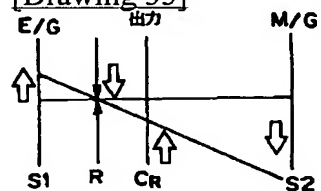
[Drawing 33]



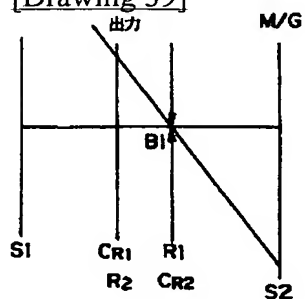
[Drawing 34]



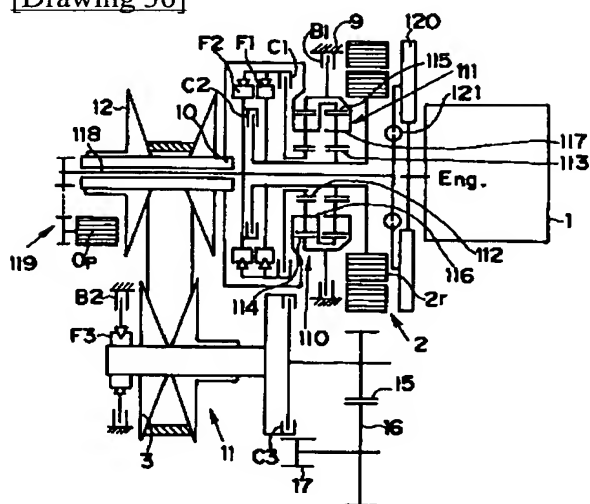
[Drawing 35]



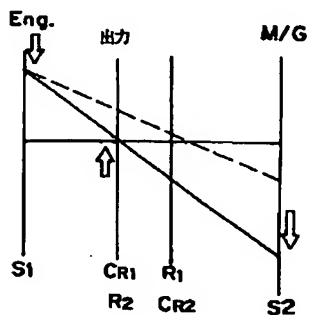
[Drawing 39]



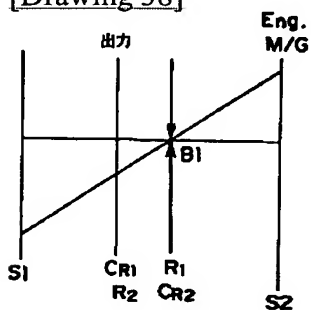
[Drawing 36]



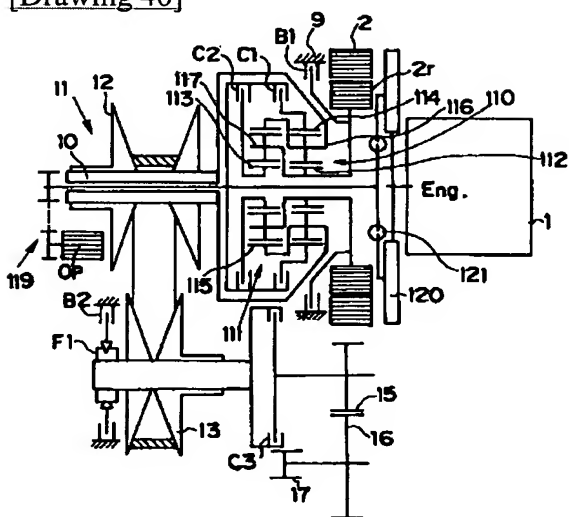
[Drawing 37]



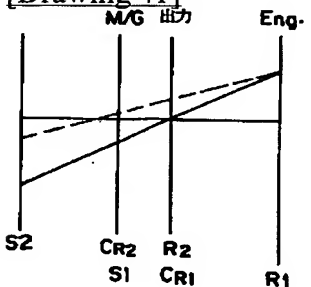
[Drawing 38]



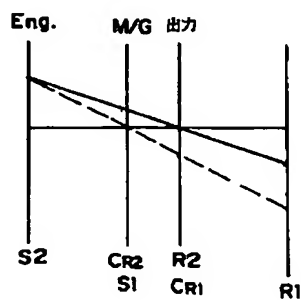
[Drawing 40]



[Drawing 41]



[Drawing 42]



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[Translation done.]